JANUARY 1941 Thirty-Five Cents Per Copy

**February** brings you Coal Age's 30th Annual Review and Progress Number. Filled to the covers with history-making 1940 accomplishments, the contents point toward many things to come this year and in the future. It's your handy reference number. . . . **Ventilation,** most necessary now—and always—is featured in this issue specifically for mechanized mines. First of a series of three articles written for *Coal Age*, J. H. Dickerson practically pegs the use of auxiliary fans by rule and reason in the timely presentation beginning p. 44. . . . **How drawslate is held** by systematic timbering and how over-all production costs have been lowered by self-loading conveyors in the Pittsburgh seam will soon be told in *Coal Age*. Claude Ferguson, superintendent, Jefferson Coal & Coke Co., will give the pertinent details of this interesting installation. . . . **Mine communication systems** usually are inadequate and cost much money besides. Maureen Coal Co., in West Virginia, is successfully using portable two-way "radio" speaker units, utilizing mine trolley for carrying the high-frequency waves, for conversations from the mine to surface simply by connecting a set to the wire at any point. Use of this new device

(CONTINUED ON PAGE 7)

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# Coal Age

Volume 46 Number 1

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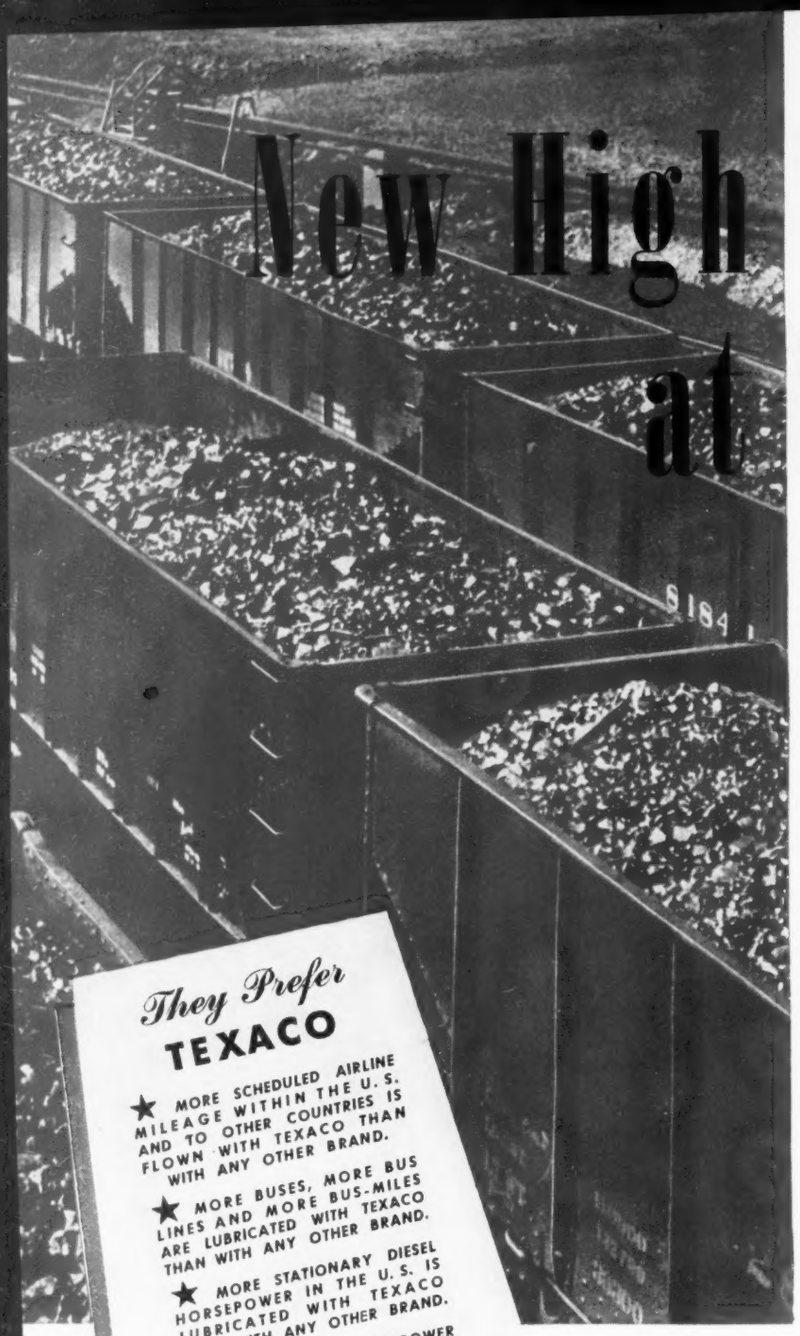

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every Saturday afternoon, NBC. See local newspaper for time and station.

TEXACO REG. T.M.

# TEXACO Lubricants

## FOR THE MINING INDUSTRY

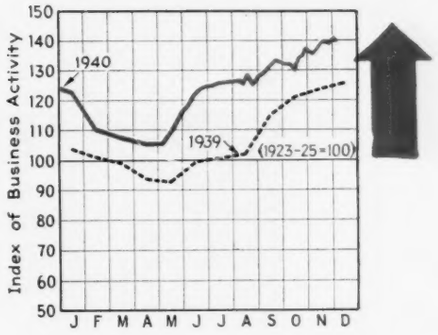
(CONTINUED FROM PAGE 5)

is told, p. 52. . . . **How small fires** can be quickly and efficiently extinguished where coal is brought down with carbon-dioxide filled shells will be described in an early issue of *Coal Age*. This use of Cardox shells, worked out to standardized practice in the mechanized mines of Pittsburgh Coal Co., is written by H. C. Rose, production manager, and E. C. Skinner, assistant to superintendent, Lindley mine. . . . **Small mines** can meet market demands for clean coal—and at low costs—by modernizing. This rule is again proved at Ol' Elliott mine of Moberly Fuel Co. Many shaft operations in Missouri closed because of high costs, but not this one. For a quick picturization, with text, see p. 48. . . . **Selective mining** by loading machines is known, though rarely is the operation described in sufficient detail to follow through the complicated face-preparation and loading cycles. At Sayreton No. 2 mine in Alabama, Republic Steel is removing and gobbing a heavy parting as part of its mechanical-loading procedure, which will be described in an early issue of *Coal Age*. . . . **Meetings** in Terre Haute, Pittsburgh and the 15th Bituminous District opened discussions on subjects ranging from the Coal Code to mine safety and from training mine personnel to dust control. Highlights of these institute subjects will be found in the news section, starting p. 77. . . . *Coal Age's* staff extends hearty greetings and best wishes for the new year.

# HOW'S BUSINESS

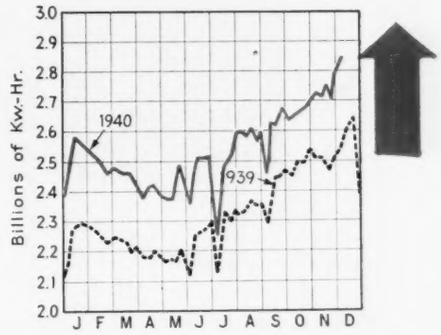
### GENERAL BUSINESS CONDITIONS

Business men, according to *Business Week*, are looking ahead with confidence. Instead of asking if business is going to be good this year and profits will exceed those of the year just closed they are wondering if available capacity and man-power are sufficient to meet production requirements of the defense program and expanding peace-time demand. The *Business Week* Index touched another new high of 142.1, according to its issue of Dec. 7, reacting slightly to 141.0 the following week.



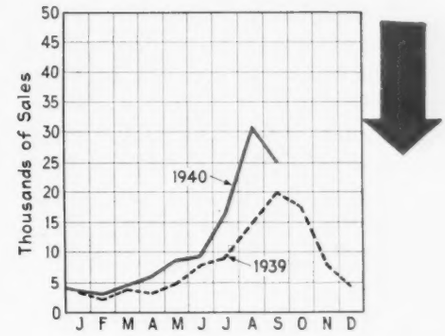

### ELECTRICAL POWER OUTPUT

Output of electric energy by the electric light and power industry, according to the Edison Electric Institute, again set a new all-time high in the week ended Dec. 7 with a total of 2,838,270,000 kw.-hr. The increase over the corresponding week last year was 9.8 per cent; over the like week in 1938, 22.4 per cent; 1937, 29.2 per cent. For the week ended Nov. 16 last output was 2,752,000,000 kw.-hr.; Nov. 23, 2,695,000,000; Nov. 30, 2,796,000,000 kw.-hr.



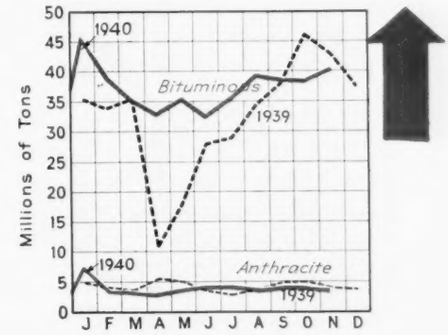

### COAL STOKER SALES

Mechanical stoker sales in the United States in October last totaled 25,503 units (U. S. Bureau of the Census from 107 manufacturers), compared with 31,337 in the preceding month and 18,416 in October, 1939. Sales of small units in October last were: Class 1 (under 61 lb. of coal per hour), 22,800 (bituminous, 21,137; anthracite, 1,663); Class 2 (61-100 lb. per hour), 1,445 (bituminous, 1,195; anthracite, 250); Class 3 (101-300 lb. per hour), 851.




### COAL PRODUCTION

Bituminous coal produced by United States mines in November last (preliminary) totaled 40,300,000 tons, according to the Bituminous Coal Division, U. S. Department of the Interior, which compares with 38,700,000 tons (revised) in the preceding month and 38,700,000 tons in November, 1939. Anthracite tonnage in November last (preliminary) was 3,869,000, according to the U. S. Bureau of Mines, against 4,234,000 in the preceding month and 3,989,000 tons in November, 1939.



ADVERTISING PAGES REMOVED

# You Save Seven Ways Every Day You Operate—

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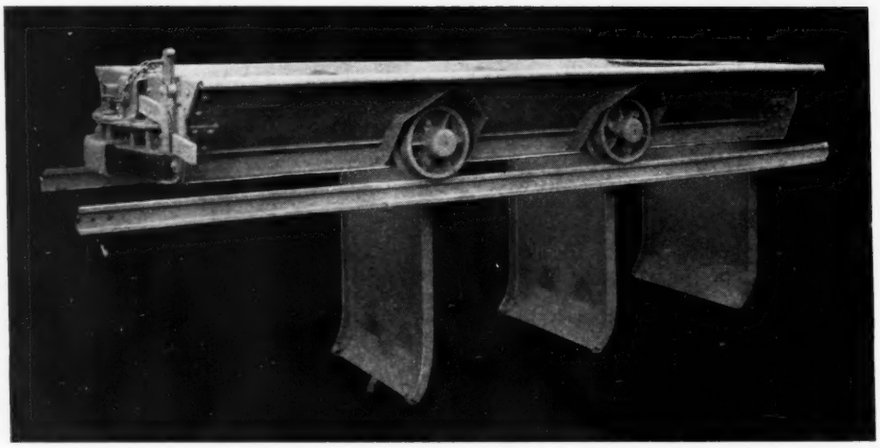

Have you ever seen a train of S-D "Automatics" glide across the tipple at the rate of 20 cars per minute without stopping? With the natural movement of the cars opening and closing their doors in a 1-2-3 order, gently discharging the coal, with never a hand touching them, and without expensive dumping equipment? If you've never had that thrill, then you can't really appreciate what the development of the S-D "Automatic" will mean to you in savings! For in the space of these few seconds at the tipple 5 exclusive savings are being made. Couple these savings with maximum capacity per given over-all dimensions and minimum dead weight per unit of pay load, afforded by its new construction features and you have mine car perfection!

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TRAILERS · WHEELS · SHEAVES

### THE SEVEN LOSING WAYS

1—Time wasted at tipple

2—High maintenance costs due to strain of end and rotary dumping

3—Investment in upkeep cost of expensive dumping equipment

4—High degradation of coal, because of DUMPING

5—20 to 50 extra cars required for "standing trip" at tipple

6—Tipple Labor costs

7—High Cost of dead weight

### THE S-D SAVING WAYS

1—Coal discharged in transit, no uncoupling

2—Since S-D Automatics stay level on their wheels when discharging, there is no strain on car

3—No dumping equipment used

4—Minimum degradation because load is NOT DUMPED; it is LAID down gently

5—Extra cars eliminated—trip returned immediately by same motor

6—No labor used since load is automatically discharged

7—New S-D construction features provide greater percentage of pay load to dead weight—with far greater strength

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

# Coal Age

Established 1911 — McGraw-Hill Publishing Co., Inc.
SYDNEY A. HALE, Editor • JANUARY 1941

## Pertinent and Impertinent

• TWO CENTURIES ago Benjamin Franklin started the trend away from wood as a domestic fuel. He did it with his fireplace stove. Now L. E. Seeley and F. W. Keator, of the Yale School of Engineering, would reverse that trend with a new wood-burning space heater. Should this threat to Poor Richard's enterprise go unchallenged? Maybe it would be smart for the industry to indulge in some intensified researching of its own into coal-fired space heaters, upon which, say these sons of Eli, there has been little scientific investigation.

• SINCE minimum prices became effective three months ago several hundred petitions for revisions have been filed with the Bituminous Coal Division of the Interior Department. With few exceptions, petitioning producers have asked for changes which would reduce prices. So long as that tendency persists the industry will escape the dangers of an empty security based upon prices which drive business to competing fuels.

• BUSINESS ANALYSTS who forecast a railway net operating income of $95,000,000 to $100,000,000 for October now explain the drop to approximately $83,000,000 as due to the slump in coal traffic. Said slump, in turn, was chargeable to heavier stocking by consumers in advance of the government minimum prices on bituminous coal. Just another straw to indicate how big a stake the railroads have in the prosperity of the coal industry. But we still tout diesel passenger locomotives.

• "LET GEORGE do it" is still a convenient refuge for the procrastinating and the ultra cautious. There is always time to take up the new development after some more foolhardy soul has sweated out its imperfections and made it work successfully. Smart reasoning—if inconstant George is not already capitalizing on some still newer and more profitable method before his conservative competitors are ready to follow his earlier trail.

• MULTIPLE-SHIFT operation of coal mines will continue to grow. It means not only increasing tonnage without increasing physical mine capacity but also more effective use of equipment. If a mine can wear out a machine in half the usual time by double-shifting, obsolescence cannot rear its costly head as high. And introduction of a third shift, to quote R. L. Ireland, Jr., "is where we will get the last squeal out of our investment in equipment." Sometimes the last squeal is the most profitable one. All of which, incidentally, calls for machines that are hogs for punishment.

• SAFER, perhaps, than guards are safety-minded men. All the adjuncts of safety are essential, but greatest of all is the mind of the man that keeps his eyes wide open for his own protection. In most cases, the victim is an accessory to his own accident. He was asleep at the switch or it might not have happened.

• COAL MINING may lack the Hollywood glamour, but it's big-time stuff to the economist. As N.C.A. points out, bituminous coal is a $3,000,000,000 business—three times the box-office take of the movies and 50 per cent more than the national public-school bill. Three billion is real money—even in Washington.

• SYNTHETIC BUTTER from coal is again making its appearance in the news stories. Members of Herr Hitler's Gestapo police are said to have been the guinea pigs in a three years' test of this fat substitute. That may explain a lot of things it has been hard to understand. Assuming the synthetic product has all the virtues credited to it, the real question becomes: Will the coal mine or the oil well take over from the discontented cow?

### Price Control

WHEN N.R.A. was launched, many coal men viewed it with misgivings. Before it had run its course, the National Coal Association was formally on record urging its continuance. In the meantime, several of its earlier critics had become some of its strongest supporters. That change set the stage for the enactment of the Guffey-Snyder act and for the present Guf-

fey-Vinson law, which expires April 26.

Enacted nearly four years ago, it is only within the last three months that the price-fixing machinery set up under it has really begun to function. The record in that brief period has been wholly creditable to the Bituminous Coal Division of the Interior Department. That agency has shown a disposition to act fairly, sympathetically and promptly on the many petitions for changes which have flooded it. If it has not satisfied everybody, there is nothing surprising in that.

The statute itself is open to criticism on several points which have been stressed several times in these columns. But the time has been too short to put these criticisms to the test of experience and to determine how many of them can be avoided by judicious administration. It seems unlikely that Congress will allow the measure to expire by inaction or that it will consent to an emasculation of the law. Indeed, in view of the scrutiny being given other commodity prices as a result of the national-defense program, abandonment of the present control might be extremely impolitic.

Under these circumstances, a simple extension of the act for another two years, as recently suggested by Secretary Ickes, would seem to be the wisest course. Any proposals for revision would lead to time-consuming debate when time may be better employed. Distraction from more important tasks, confusion and uncertainty would be inevitable. Keeping production geared up to the rising fuel demands of the defense program is the biggest job ahead for 1941. Nothing should be permitted to interfere with that job.

## How Permissible?

RIGID SPECIFICATIONS for the construction of permissible equipment may be laid down by the Bureau of Mines. Manufacturers may follow these specifications to the last bolt and thread to win the coveted plate. And the first time that piece of equipment goes into the mine shop for inspection, overhauling or repair its permissibility may be destroyed through carelessness or ignorance. A little too much speed in reassembling and some of the vital protective parts may be left out or improperly replaced. Where such conditions exist, the remedy is plain: thorough and continuous education of the maintenance men on what permissibility means. There is no other way—and that way is closed if top management is indifferent.

## The Payoff

AS IMPORTANT as research is the establishment of an organization to convert research discoveries into profitable business ventures. If the steel, electrical and chemical companies that spent many millions on research had not followed up their discoveries and data sheets by sales efforts, their expenditures would have been a criminal waste of their stockholders' money. Much of the research work of the colleges and industrial organizations has been almost nullified by the lack of either money or a desire to spend it in selling the findings as equipment possibilities or usable information. An organization whose discoveries are allowed to die from a lack of commercial follow-up will soon find itself without funds to continue research.

## Job for Anthracite

ANTHRACITE ASH, as Mellon Institute has found, is a marvelous land-betterment agent, but nothing effective has been done to dramatize that fact to the public. New York City has a large area covered several feet deep with this ash. The World's Fair authorities leveled off this ash and covered it with a clay muck from a swamp to the depth of some inches, though the ash itself would have made a better soil.

Now that the Fair grounds are to be made into a public park under Robert Moses' direction, why not induce him to plow the ashes into the muck or cover the muck with new or old ashes? The entire job is to take three years. He should have a good opportunity to try it tentatively during the first year and more intensively thereafter. But he will have to be sold on the value of ashes for land betterment. Here surely is drama and an opportunity to establish good relations with the city and to make the urban home owner anxious to have ashes for the improvement of his own grounds.

## Duck's Back

WATER flows off a duck's back with such facility because of an oil which has the property, as Professor A. F. Taggart, Columbia School of Mines, recently showed, of breaking up with almost explosive violence a blob of mineral oil resting contentedly on the surface of the water. An almost infinitesimal quantity of greatly diluted oleic acid will turn the trick. Possibly this same acid, which thus reduces surface tension, can be made to help water free itself from coal and will be a means of making it easy to drain fine coal now requiring evaporation before shipment.

## Painless Patterns

IN THE CONDUCT of life, everyone has large and small objectives. Working to attain them frequently is a definite pleasure, but to be diverted from any objective by any intrusive issue is exasperating and may result in an attempt to avoid duties that such an intrusive issue involves. If such intrusions are to be kept from becoming displeasing, they should be recognized as minor objectives and part of the moment's work. Thus, the main objective of a miner is to load coal; the intrusive issue is to sound roof, set a post or take down top.

If, by repeated performance according to a certain schedule, these duties are done in a standard manner, they become objectives and part of the pattern of the work—not a vexatious delay. Here is where discipline counts. It gives the miner a new objective; he gets out coal and also keeps his room in a certain standard condition. It becomes almost incidental that it is a safe condition that is demanded. Posting becomes an end, not a means.

# HIGH POINT MINE

## More Than Doubles Output Per Man With Conveyor Units in Caryville, Tennessee

USING conveyors under difficult conditions in thin-seam operation, the High Point Coal Co. has increased production per total employee 132 per cent in the last two years. Mining the Pee Wee seam, averaging 33 in. in thickness and lying 2,355 ft. above the valley level in the Cross Mountains, Mine No. 1 is situated along the Southern Ry. in Caryville, Campbell County, Tennessee.

Overlain with strata varying from 6 to 16 ft., consisting of rash, gray slate and conglomerate between the main and a rider seam of coal, top requires careful timbering. Bottom is of hard gray slate which rolls to such an extent that grades up to 20 per cent are often encountered.

The double entry, room and pillar method is used throughout the mine, with mains on 2,500-ft. and butt entries on 600-ft. centers. Mains are developed with a Goodman 512-DA 210-volt shortwall and a Goodman G-12½-B-74 shaker conveyor. The cutter is equipped with a 7½-ft. bar and No. 64 "throwaway" bit cutter chains, in which bits are set for a 5½-in. kerf. Main entry haulways are driven a distance of 300 ft. before the conveyor is moved to the aircourse which is then advanced a similar distance. Coal is loaded directly into the mine car from the shaker conveyor by means of a curved discharge trough. Pan line is carried along the left rib and track is advanced in the haulway as face advances. In driving aircourse the same loading point is used for the haulway, a 90-deg. angle trough being installed in the pan line to transfer coal to the loading point. Two face men and one boom man cut, drill, shoot, load and timber.

**Formerly operated as the New Caryville Coal Co., Mine No. 1 was taken over by the High Point Coal Co. in 1934. At that time all coal was hand loaded and present management stepped production up to 300 tons per day with a total of 135 men on payroll, but operating costs were high. Due to adverse roof conditions and undulating bottom, the company modernized slowly, beginning with one shaking conveyor unit for experimental purposes. Today, all production is mechanized and output per man-shift is two and one-third times the tonnage formerly loaded by hand.**

By GEORGE HENDERSON
*Superintendent, High Point Coal Co.*
*Caryville, Tenn.*

Electric drills with 1½-in. augers are used to place two rib holes in each cut and are charged with 1½ to 2 sticks of permissible explosive in each hole. Clay stemming from surface is brought in by the supply crew. Shots are fired singly by a shot-firing attachment on an electric cap-lamp battery.

Posts are set on 3-ft. centers and are later replaced with crossheaders wherever necessary. Coal is loaded on the first and second shift and a three-man crew follows on the third to take bottom and advance the track. Bottom is drilled with an air hammer, the number of holes and quantity of powder varying according to local conditions.

Since only one room panel is worked at a time, no butt entries are started until just before the preceding panel of rooms is finished. Butts are driven on 50-ft. centers, the haulway being 12 ft. and the aircourse 15 ft. wide. Bottom in butt entries is taken along the haulway for height, varying between 18 and 30 in., according to local conditions.

Butt entries are driven 300 ft., with the shaker conveyors discharging directly into the mine car on the first set-up. After this advance, conveyors are moved up and 300 ft. of 24-in. Goodman Type 95-A-24 belt conveyor is installed behind the shaker. The shaker then discharges onto the belt, which in turn delivers directly into the mine car on the main haulway. Shaker conveyor and belt are advanced until the butt entry is in a distance of 1,064 ft. Belt conveyor is then extended to a total distance of 1,000 ft. and room work is started on the retreat. All track is eliminated on butt entries.

Two rooms are driven off each side of the butt entries at the same time with four Goodman Type G-15-A-74 shaker conveyors. Rooms are on 90-ft. centers and, governed by prevailing roof conditions, are 60 to 70 ft. wide. Left-hand rooms are first necked for 15- to 20-ft. widths and a depth of about 20 ft. before being fully widened. The conveyor drive is so set that the pan line extends 10 ft. from the left-hand rib to discharge directly onto the mother belt conveyor. Rooms on the right-hand side are necked in the same manner and the drive is set up in the breakthrough in the chain pillar. These breakthroughs are placed to slightly

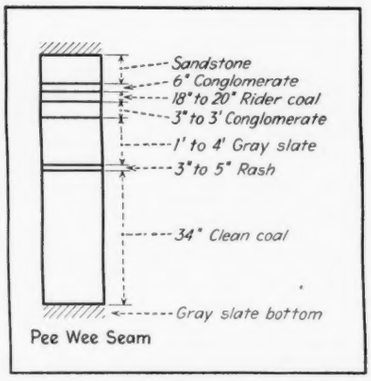
stagger the discharge points and obtain uniform loading of the belt conveyor.

A six-man crew is employed at each room face, four loaders, one machine man and one timberman working in their respective operating cycles. The machineman cuts about 20 ft. of face from the right rib and the kerf partly is bugdusted, drilled and shot. This coal is then loaded by the four hand loaders into the face pan line, while the machineman continues cutting until the place is finished. By this time the first part of the cut has been loaded and the machine is pulled back across the face to start another cut.

Four holes are used in face shooting, two on ribs and two pop shots wherever the cut hangs up. Holes are started in the middle of the seam and are drilled at an angle to reach the top of the coal at the back of the cut. Permissible explosives are used, 1½ sticks in the rib holes and one stick in each pop shot. Tamping is done with clay dummies. The cut is bugdusted only directly under each shot.

The face pan line is a continuation of the main shaker conveyor and receives its motion through a 90-deg. angle trough. Four or five 13-ft. troughs are carried in front of the 90-deg. angle turn, according to the width of the room. A 16-ft. telescopic trough is used directly behind the 90-deg. turn, which enables the loaders to take out two cuts of coal before adding a pan. Room conveyor line is advanced after each cut to within 5 ft. of the solid face before shooting and the 90-deg. turn is advanced by the four loaders without the power aid of cutting machine. Face pan line is then advanced by the four men, using bars, without disconnecting it. The sixth crew man spends practically all of his time setting timbers, on 3-ft centers, with two rows for each cut. Also, safety posts are set next to the face on 5-ft. centers before shooting, as the company enforces a ruling that at no time shall a face man be more than 5 ft. from a prop.

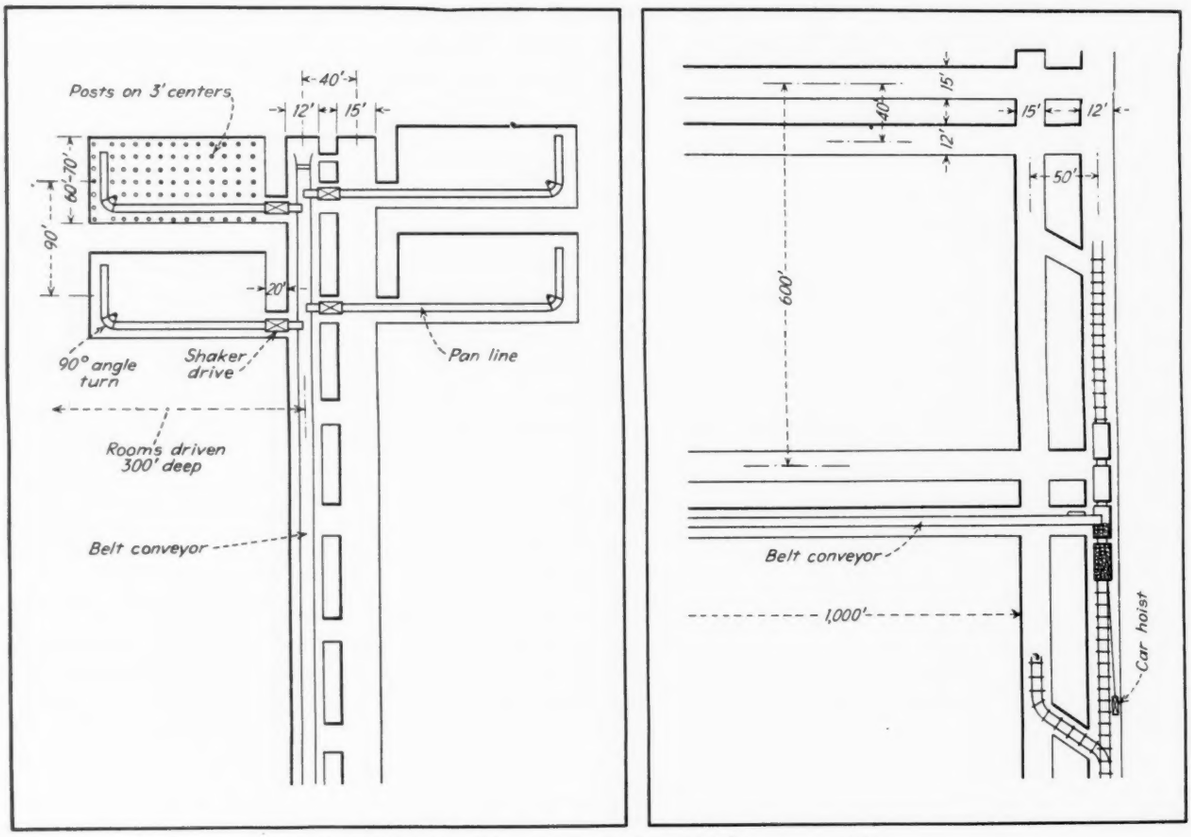
Directly above the coal lies a band of rash averaging 3 to 5 in. in thickness which comes with the shot and is removed by the loaders. After working the rooms to a depth of 300 ft., conveyors are moved to the next room and the cycle continued until the panel of 20 rooms is completed. A 100-ft. barrier pillar is left to protect main entries.




Elevation: 2,355 ft. above valley level.
2,450 ft. above sea level.
Hard-character coal.
Pronounced cleats and faces.
Rooms are driven on faces.

**Cross-section of seam and the immediately overlying strata.**

Coal discharging from the four shaker conveyors onto the belt conveyor is, in turn, discharged directly into three-door drop-bottom steel mine cars, each having a capacity of approximately 3 tons conveyor loaded. Trips of six cars are pulled under

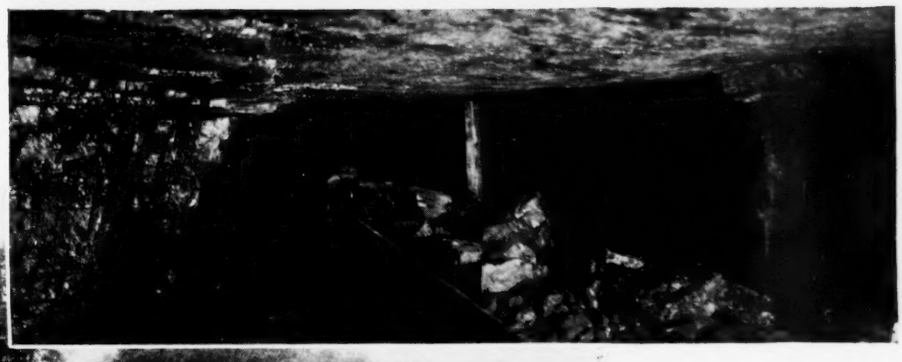



Left—Method of working rooms in shaker and belt-conveyor mining.
Right—Discharge end of mother belt.

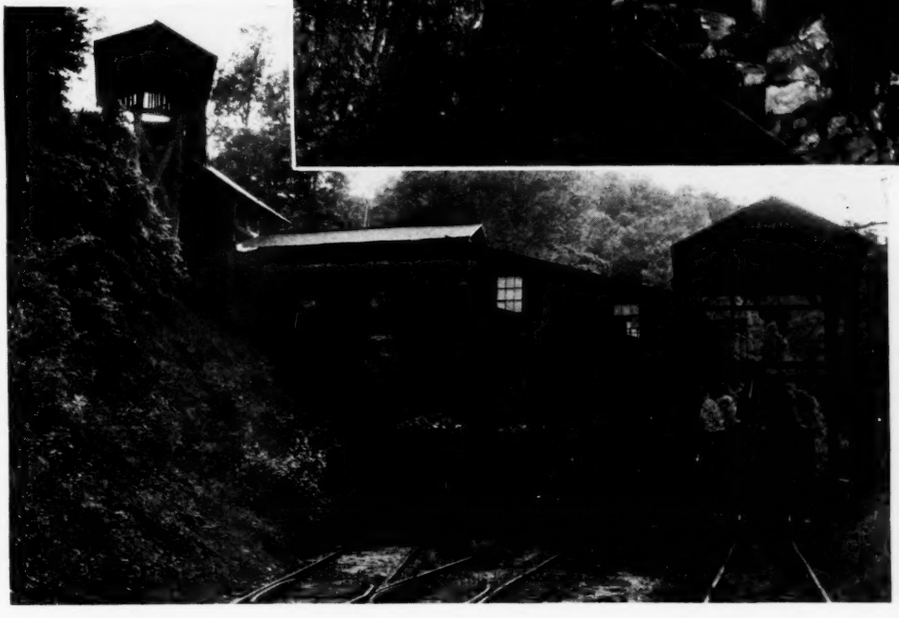
Shortwall machine cutting across the face. Conveyor is not stopped while place is being cut. Loose coal has "popped" off the face after cutting.

Looking from left to right across the face. The left-hand rib hole has just been shot. Note the 90-deg. angle turn and the close timbering.

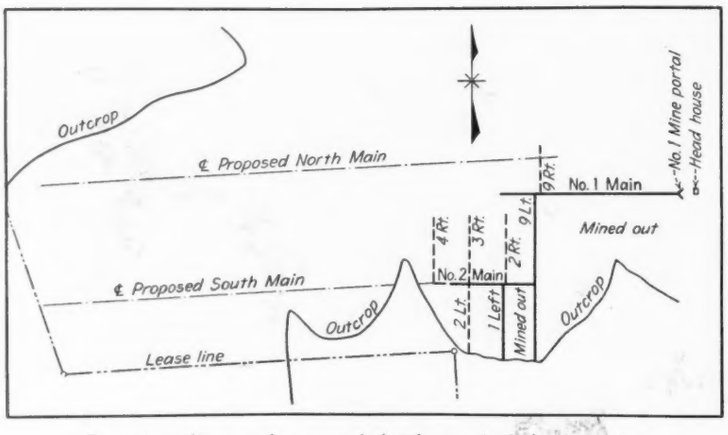
Looking along the pan line from the drive toward the face. Note the blower tubing at left.



Looking along the belt conveyor



Scene showing three-track tipple. Monitor cars discharge into bin at top left of picture.




Present workings and proposed development of the property.

the loading point by a car hoist.

Cars are collected by a 7-ton Goodman locomotive, which pulls the trip to the outside and through the headhouse, where they automatically unload into a bin. Car doors are automatically closed, and the motor then uncouples and travels over a "run-around" track to the rear end of the trip, which is returned to the loading point sidetrack.

## 215 Tons Storage

The headhouse bin holds 160 tons, which, with eighteen steel cars, gives a capacity of approximately 215 tons storage, enabling a two-shift production day with the tipple running only one shift. Coal from the storage bin passes down a chute into 13-ton monitors traveling the mountain between the headhouse and the tipple, a distance of 6,380 ft.

Monitors are controlled by a gravity hoist and cars operate over a three-track system of 56½-in. gage laid half way down the slope to a point where they become four tracks, in order to allow the two cars to pass. A 75-hp. 440-volt a.c. hoist equipped with both solenoid and hand brakes is used to pull the 35-capacity man-cage up the slope.

Both monitors are of the hand ratchet drop-bottom type and discharge into a 30-ton bin at the tipple, from which the coal is carried to the shaker screens by a flight conveyor. Since coal is cleaned at the face, it passes directly from the shaker screens to railroad cars. Lump, egg, nut and a slack coal combination are loaded.

Alternating current is purchased at 2,300 volts and converted to d.c. by a 150-kw. G. E. rotary at the substation located near the drift mouth. Mine power is distributed by a 4/0 trolley and a 4/0 feeder line. All rails are double-bonded in order to insure a good ground. In butt entries two 4/0 trolley lines are carried on double insulated brackets set on posts. One line carries the power for the conveyor drives and the other for cutting machines and blowers. A double ground return consisting of one 4/0 trolley line and 3/0 wires is carried. With this hook-up the man at the loading point is able to start and stop the shaker conveyors without interfering with the operation of the cutting machines and blowers. A control switch is installed at the face of each working place so that face men can control the operation of their own conveyors. Fused nips are used on all cutting machines.

All men are required to wear hard-toed shoes, hard hats and safety goggles. In 1939 the company presented to all of its employees a pair of goggles to wear underground and the number of eye injuries have since been reduced to practically zero. If at any time goggles or hard hats are damaged while at work, men are given new ones by the company. Although this is a non-gassy mine, electric cap lamps are used.

With the mine producing two shifts per day supplies are taken inside during the off-shift by a crew of five men and a foreman. Between 450 and 500 props are required per day. These posts are unloaded from the mine car onto the belt conveyor running in the reverse direction to carry them up to the room necks. From there they are taken to the face on a timber truck which runs in the conveyor pan line, and are stored in each working place. The crew also keeps trough sections and ball frames at the faces, and any other supplies that may be needed.

In hand-loading days No. 1 mine production varied between 200 and 300 tons per day with a total of 135 men on the payroll. At the present time average production ranges from 340 to 400 tons per day with 86 men on the payroll, or an average of about 9 tons per man-shift into the mine car.

The executive and operating organization includes: O. W. Robinson, president; C. W. Henderson, treasurer and general manager; E. S. Raiford, secretary; George J. Henderson, vice-president and superintendent; L. L. Duncan, mine foreman; Joe Gider, electrician, and R. Y. Wert, chief engineer.

Vice-President and Superintendent George J. Henderson on the job.

# SPLIT SEAM

## Mined in 2-Ft. and 8-In. Benches And Divider Left in Pit at Missouri Strip

CHANGING the plan of mining because of a 1-ft. rock divider, the Bevier strip mine of Binkley Mining Co. of Missouri, at Macon, is now working the coal in benches and leaving the divider rock in the pit. When opened in 1937 with a proposed output of 500,000 tons per year the entire seam was sent to the washery. Now, several cuts from the outcrop, the thick divider rock has come in about 12 in. up in the seam. Rather than haul this unproductive material and reduce plant output, lower efficiency and increase costs, the present method was developed through two-shift operation of the loading shovel and installation of a second smaller shovel.

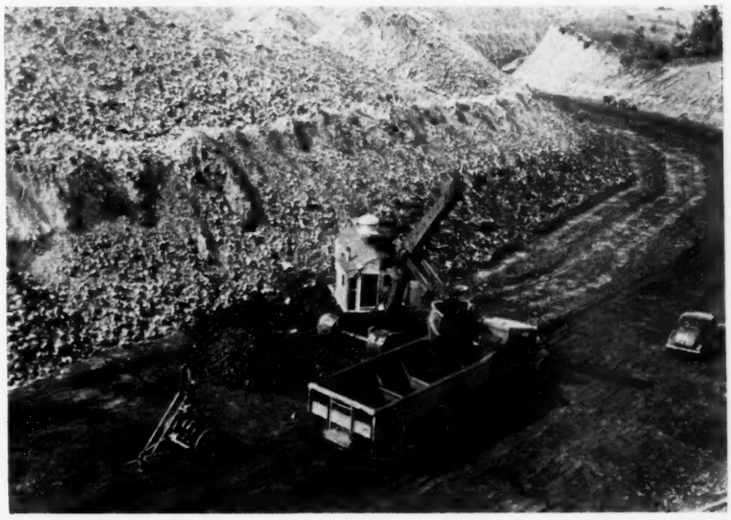
Overburden thickness varies from 14 to 75 ft. and is a hard gumbo clay with 2 to 19 ft. of soft shale on top of the seam. It is stripped without blasting by a Bucyrus-Erie 950-B shovel with 30-cu.yd. dipper which makes a buckwall (berm) on the spoil bank to keep lumps from rolling into the pit. The pit is 75 ft. and the coal cut 35 ft. wide. The Bevier seam mined is 3½ to 4½ ft. thick and is divided into two benches by a 12-in. slate-pyrite band. The upper bench is 2 to 2½ ft. and the lower 8 to 12 in. thick. The seam is underlain by 6 to 8 in. of sandy fireclay.

The rock divider is not loaded with the coal but is left in the pit by mining the benches and divider separately. Where necessary, the top bench is broken by drilling 2-in. holes on 10-ft. centers to the top of the divider with an electrically operated Hardsocg vertical auger. Each hole is loaded with one-half stick of pellet powder.

An 85-B shovel with 5-cu.yd. dipper loads the top bench into trucks during the day shift. On the night shift this shovel strips the divider off an area averaging 700x35 ft. and dumps it onto the side of the spoil bank. The shovel also digs up the thin bottom bench of coal and piles it along the unmined coal berm. Then during the day shift, while the 85-B is loading the top bench, a 50-B shovel with 1¾-cu.yd. dipper loads the piled bottom-bench coal into trucks. The usual proportion is three trucks of top-bench coal to one from the bottom bench, which is dumped into and blended in the 90-ton hopper feeding the washery. Because of the rock divider, the lip on the 85-B dipper was strengthened by increasing it from 1½ to 2 in. Pit crew for this shovel comprises two drillers, one shotfirer and two rib cleaners, who also help in deadheading, etc.

Four 25-ton air-operated bottom-dump semi-trailers operate over a round-trip haul of 3½ miles. With increasing distance, two Dart haulage units with 180-hp. gasoline engines—50 hp. more than the older units—are being added to make possible a 7-mile cycle. All units are equipped with lug-type tires on the drives. They travel outside the stripped area and enter and leave the pit by arterial roads through the spoilbanks. While in the pit, travel is on the coal. The 40-ft. roads contain a 12-in. layer of 2-in. limestone quarried and prepared by the company. Two 8-ft. blade maintainers and a 1¼-yd. diesel dragline do road and ditch work. Six sled-mounted pumps, three electric- and three gasoline-powered, dewater the pit.

All output is cracked to 6 in. and washed in two boxes in a six-track McNally-Pittsburg 2,400-ton plant. Fifteen sizes are made and the ¾x0-in. is dewatered in a McNally-Vissac dryer.



This 1¾-yd. shovel loads the 8- to 12-in. bottom bench into 25-ton semi-trailers. At the same time a 5-yd. shovel is removing the 2- to 2½-ft. top bench in another part of the pit. Note the divider rock thrown on the side of the spoil bank during the night shift by the 5-yd. shovel. Left is electric vertical auger for drilling the top bench.

# HOW TO USE AUXILIARY FANS

## With Utmost Safety When Operating Mechanical Loaders and Room Conveyors*

**Mechanization demands more air locally than hand loading though less air may satisfy needs of entire mine. Resistance of air in passing cars cuts air volume materially. The greater quantity of gas and dust in mechanized workings makes more air necessary. How blower fans will help ventilation when properly installed. How to locate them so that they will operate without recirculating gas and dust and therefore with maximum safety.**

By J. H. DICKERSON
*Consulting Engineer*
*New Philadelphia, Ohio*

THOUGH mechanical loading and mine conveyors have caused a concentration in mining, which aids ventilation, they have introduced also new problems and dangers, which should be carefully considered and understood by all mine officials. Because of the larger quantity of coal dust raised, the greater frequency with which the coal is cut and blasted, the larger quantities of methane in consequence released and the greater necessity of clearing the air rapidly for efficiency and safety with mechanization than with hand loading, a mechanical-loading section usually will require more air in proportion to its extent than a hand-loading section. The desired tonnage can be produced from fewer sections, and therefore less air probably will be needed as a whole than for the same tonnage with hand loading, but more or larger airways may be required to, from and in any section where the coal is loaded mechanically.

### Some Methane in All Mines

All coal mines are gassy. Mines never known to contain methane have developed that gas in measurable quantity after mechanical loading was introduced and therefore probably thereafter should have been classed as gassy. Methane may have been evolved before, but in such small quantities that it was carried away by the air so rapidly, and therefore in such low concentration, that it was not noticed. With mechanical loading, because as many cuts may be made in a day as formerly were made in a week, the quantity of methane released is greatly increased.

Though an open light or match alone will hardly ignite the dust-laden air that might develop in mechanical loading, either of them may set fire to methane collecting along the roof not promptly removed by the ventilating current. They also may ignite a small quantity of gas liberated in shooting, or derived from carbide, etc., if, being imperfectly mixed with stagnant air, it should collect in a "pocket." A dust explosion may result, more severe than one caused by methane alone. Dust may be ignited also by a blow-out shot, by explosives accidentally ignited in the mine, or by a short-circuited electric cable imperfectly insulated.

A large part of the cross-section of a room heading is unavailable for the passage of air when conveyors are loading mine cars, and much of the time this unfavorable condition obtains. If crosscuts between rooms are not driven or are closed and an additional passage for air is not provided, the cars in the heading may cause such serious resistance to the flow of air as will reduce greatly the quantity delivered. Before mechanization, the same difficulty occurred to a limited extent whenever locomotives were distributing cars for hand loading, but between trips were comparatively long periods when the headings were empty and ventilation was normal.

### Cars Block Airways Badly

Cars which occupy 17 per cent of the cross-section of the heading and are spaced 25 ft. apart along that roadway each cause as much resistance as 100 ft. of unoccupied heading, and the resistance due to a car occupying 40 per cent of the cross-section is about equal to that of 400 ft. of clear roadway.[1] This blocking of the airway not only makes necessary an increase in mine pressure and power consumption but reduces the quantity of air in the heading, so that it usually is less than the needed volume.

Where, as an aid to mechanical loading, State mine inspectors consent to the driving of rooms entirely without crosscuts, reliance is placed on blowers to carry air to the face, but for safety and a fresh-air supply much air must pass through the heading or a large part of it will be

* First of a series of articles on ventilation.

[1] Greenwald, H. P., and McElroy, G. E.: Coal Mine Ventilation Factors, U. S. Bureau of Mines, Bulletin 285, 1929, p. 106.

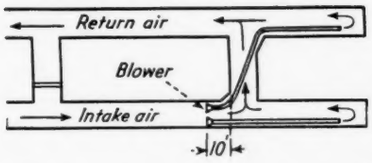



Fig. 1—Fan provided for each heading of entry, set 10 ft. outward of outby rib of crosscut.

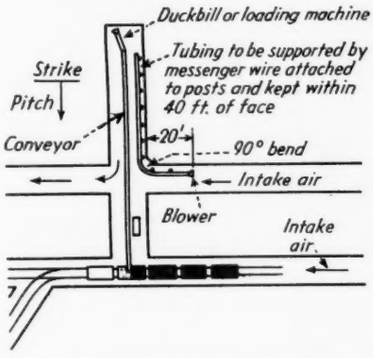



Fig. 2—System used by Union Pacific Coal Co. for ventilating uphill places. Note that there is a second intake airway additional to that used for haulage; thus air is free from dust and unimpeded by cars and locomotives.

recirculated by the blowers.[2] Formerly haulage headings on reaching the first room rid themselves of the burden of carrying much of the air, for some of it, starting at a split in that room, went through unimpeded crosscuts and along the faces and rooms until it finally reached a room no longer provided with a crosscut, where accordingly it was diverted to the heading. With mechanical loading, it is even more important that the heading should not be required to carry the entire air supply, yet how often is this fact not sensed?

Some mining engineers do not favor the use of portable blower fans and tubing for the ventilating of faces in which coal is loaded mechanically. Where their mines have methane, they prefer to drive the usual crosscuts between rooms and deflect the air to the face by curtains, which was the way in which their men were trained when still working in hand-loading sections. They realize that many blower fans are being improperly installed. These curtains may be a nuisance and expensive—besides they add to mine resistance—but no doubt they are safer than blower fans as commonly and incorrectly used. In many cases, fans are set so they merely churn the air, and the fact that it is moving gives the men and management a false feeling of safety.

Of one room it has been reported that a blower had churned the air until it had almost reached an explosive limit, although the same quantity of intake air, if it had not been recirculated, would have left the mine promptly and have had a low methane content. However, the foreman in this instance lacked proper knowledge and experience in the use of blower fans.

An engineer for a company manufacturing ventilating equipment says that 90 per cent of the auxiliary blower fans are being used improperly but that manufacturers' representatives are never asked how these fans should be placed, and the placing of fans is beyond their control. Other ventilating engineers deplore the way many of these fans are used, realizing that, properly handled, they are useful adjuncts in mechanical loading. All companies should have rules for the use of these fans and insist that their foremen and inspectors see that they are followed, not only for safety but also for economy and efficiency.

Two companies having splendid records for safety have given special attention to rules for portable blower fans and tubing. The Chicago, Wilmington & Franklin Coal Co. uses them especially for entry work where much methane is encountered. To show how long it has followed good practice, it is still using a print dated 1926 showing safe and unsafe methods of placing blower fans in entries.

## Use Fan for Each Heading

Fig. 1 shows a safe method of using blower fans for straight entry work in a gassy mine. With two blowers in the intake heading, and track in both headings, it becomes unnecessary to place the tubing over the heading track; air is taken from both sides of the intake airway, and in the short straight tubing the quantity of air required at each face is adjusted more readily than with a single blower and two-way tubing. Resistance also is reduced.

The company's rules require blowers to be set in the intake airway not less than 10 ft. outward from the outby rib of the open crosscut, and tubing to be suspended from the roof so that the air will be directed along the roof at the face just at the point where methane otherwise would start to accumulate. Tubing must be kept within 20 ft. of the face, or 10 ft. therefrom wherever the heading is rising, and the blower must be allowed to take no more than 15 per cent of the intake air.

It may be noted that a blower taking 20 per cent of the main air current has been found permissible for this condition in which two blowers are used, but a 15 per cent limit allows for uncertainties in measuring the air at the end of a tube and other irregularities; besides, it increases the safety factor. The company finds that blowers properly installed have proved safe, that they give better ventilation at the working faces than line curtains,

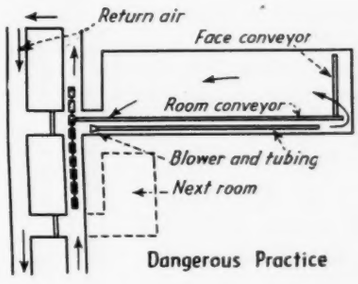



Fig. 3—Easier for used air to return to fan than for intake air to enter it, so there is much recirculation. This fan merely stirs up the air.

and remove gas more readily; besides, they speed entry work and materially reduce the pressure the main fans must develop to supply the air needed.

The Union Pacific Coal Co.'s "Code of Standards, 1937," shows how the company uses blowers for rooms and entries in mechanical loading of coal in steeply pitching seams which are not considered gassy. In four-entry work, the first and third or second and fourth faces are driven at one time, and the alternate faces are stopped temporarily. A blower and tubing is used with each conveyor. Each fan is set in the entry being worked 25 ft. outby from the last open crosscut, and the air passing in the entry must not be less than two and a half times the capacity of the blower.

Fig. 2 shows a place driven to the rise and two intake airways, in one of which no mine cars block the air. In the room work, however, crosscuts are turned every 50 ft., as required by the State law, and the

[2] Greenwald, H. P., and Howarth, H. C.: Recirculation of Air and Mine Gas Caused by Auxiliary Fans as Used in Coal Mines, A.I.M.E., Vol. 76, pp. 164-188.

total volume of air used by the blowers must not exceed one-third of the air passing in the entry where the fans are located. Much detail and several illustrations are included in the company's code.

Fig. 3 is a sketch from a recent publication, showing how a blower and tubing may be located with reference to a room conveyor. This is a dangerous practice, as the air returning to the narrow room neck will have to pass close to the blower, and most of the air will continue to recirculate to the fan. Unfortunately, this condition is not infrequent.

An even worse condition is sometimes seen, where the blower is close to the discharge end of a conveyor and draws its dust, and is on the side of the room neck by which the air would naturally leave. Thus, it is almost impossible for much fresh air to enter the fan, as, to do so, it would have to push aside or cross the stream of return air coming from the room. In this case, return air enters with ease, hence almost all the ventilation is with recirculated air and an increasing percentage of methane and dust, the latter made finer and finer by frequent collisions with tubing, fan blades and fan casing.

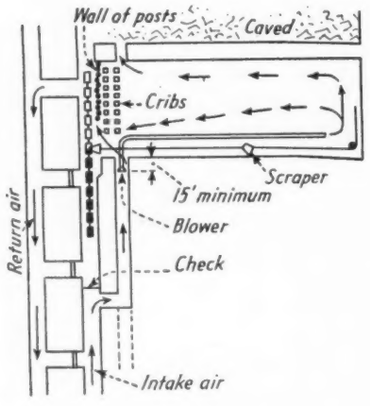



Fig. 4—Air enters by an auxiliary passage separated by a solid rib from the trip being loaded. The air does not return past the mouth of the auxiliary airway, so recirculation is impossible.

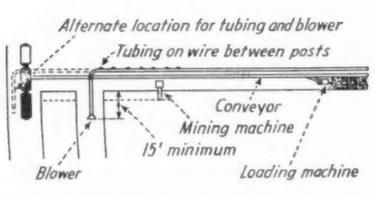



Fig. 5—Illustration of same fan and tubing as in Fig. 4, but enlarged and showing mining and loading units.

Fig. 4 is a modification of a method of slabbing using a scraper conveyor.[3] Fig. 5 shows a detail at the same location, with a loading machine discharging to a conveyor, and a cutting machine following. In both cases, an extra airway is provided to carry the main intake air around the cars in the haulage entry, delivering it to the room some distance beyond the neck. From the end of the tubing some of the air in the room will pass into the opening ahead, leading into the goaf and some will unite with the surplus air which is passing by the blower, and these three currents will enter the return airway in a single stream.

The blower will have to be raised or set further back than the 15-ft. minimum or it will not be possible to carry the tubing over the mining machine and over the coal in the conveyor. If the seam is too thin for this, and bottom is taken in the haulage heading, the blower may be set in that heading and the tubing carried over the empty mine cars as indicated in broken lines in Fig. 5. In either case, the tubing will be moved toward the face from time to time as the face advances. The additional airway is desirable even where the blower is placed in the haulageway.

Fig. 6 shows a proposed method for four conveyors, *C*, delivering coal from an equal number of rooms to a single loading point. Some operators keep the four rooms at equal length, but, by starting two at a time, with two others later, less conveyor and tubing are required and power consumption is more uniform. The sketch shows two mining and two loading machines for the conveyors. Crosscuts in the rooms will save the time of the machines in traveling from one room to the next, shorten the length of conveyor required, and help ventilation.

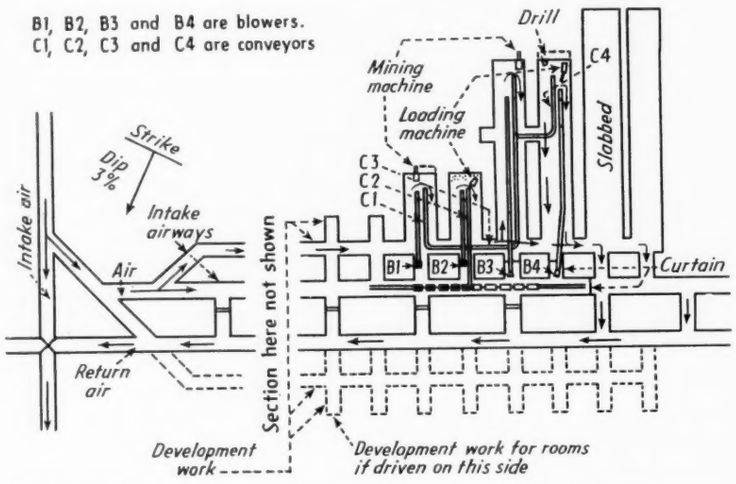



Fig. 6—In this installation, four fans are used to ventilate the several rooms.

Blowers—B-1, B-2—are placed between the two intake airways, and the flow of air coming out of the short rooms is on the room side of these airways, so there is no recirculation here. Blowers—B-3, B-4—also are placed between the two intake airways, but curtains are placed ahead of them and in the haulage entry beyond the end of the track. There will be little pressure at these points, and the curtains should be made fairly tight so that not much air will pass the loading point except that used by the two blowers. The four blowers should not take over 40 per cent of the intake air. The curtains will make most of the intake air effective in room ventilation.

Fig. 7 shows a layout for a mobile loader which is practically the same as has been often used before when working with mine cars, and the method of ventilation is the same. Check curtains were not always used but may be desirable, also one blower.

Fig. 8 shows an outline for a modified system of longwall, which may be used for machine or hand loading with conveyors. Cribs, etc., are not shown. Ventilation is simple, and may be as indicated. No blowers or tubing are necessary.

[3] Toenges, Albert L., and Anderson, R. L.: Multiple-Shift Mechanical Mining. Progress Report I, U. S. Bureau of Mines, I. C. 7014, 1938.

The principal reasons for poor ventilation with mechanical loading are as follows: (a) insufficient air in the mains; (b) insufficient airways; (c) the practice of leaving doors and many crosscuts open (this is to facilitate haulage, to save labor, or is just carelessness, but it cuts off the circulation where most needed); (d) improper use of blower fans; inspectors and foremen should give this matter special attention.

The following objectionable practices are found:

1. Blower in room neck with no other outlet for air, causing recirculation.

2. Blower in heading at side of room neck on which air has to leave, causing even more recirculation.

3. Blower placed where intake air is dusty or laden with methane.

4. Blower placed on bottom and not leveled. This is destructive to motor, bearings and drive parts.

5. Blower so nearly buried in rubbish that the air has to flow downward to the inlet. This damages the fan, interferes with the delivery of its air, and is otherwise dangerous.

6. Blower set so that tubing must make a sharp bend laterally or vertically. This increases the resistance and reduces the discharge. It is often advisable to raise blowers and set them on heavy blocks or cribs. An oversize preformed bend would reduce the resistance or increase the air flow where a bend is required.

7. Blower used where the entry is passing insufficient air, thus causing recirculation. Quantities traveling in main and auxiliary current should be checked to make sure that the fan is not taking too large a proportion of the main current.

8. Blower tubing supported on gob. This may reduce air flow, and tend to cause leaks, and reduce life of tubing.

9. Blower tubing not kept in repair. Holes or leaks at joints may cause most of the air to be lost. An adequate blower in operation at the entry does not assure that sufficient air will be delivered where it is needed. Tests should be made to see whether ample air is being delivered at the end of the tube. Be careful not to use the anemometer where the air velocity is higher than that for which the instrument is intended.

10. Blower motor with insufficient voltage due to a poor electrical return. This will cause heating, also a reduction of speed and air capacity.

11. Blower used for room work where rooms are not provided with crosscuts or a secondary airway. Mine cars, etc., may cause a congestion in the haulway so that quantity of air coming to the blower is reduced below the danger point.

12. Blower operated with no one in attendance.

In the development of mechanical loading so much attention has been given to production that changed conditions and new dangers often have been overlooked. Some foremen take chances in order to make a good showing or to hold their jobs. This is particularly true in allowing crosscuts and doors to be left open to facilitate haulage.

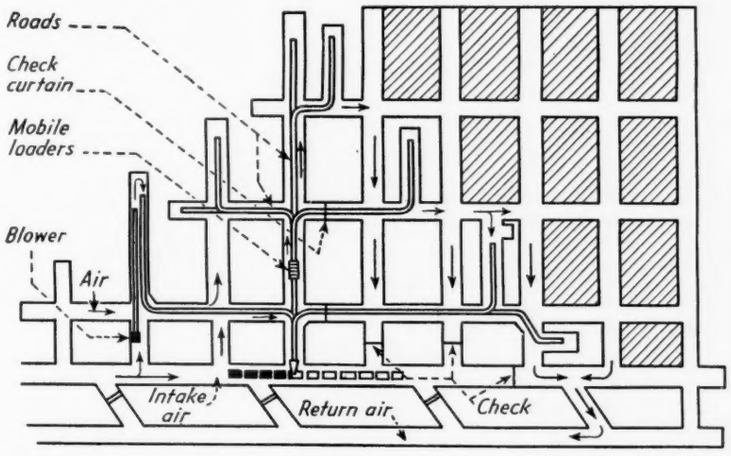



Fig. 7—Here, only one room is fitted with a blower. Blower air returns to crosscut and not to loading road.

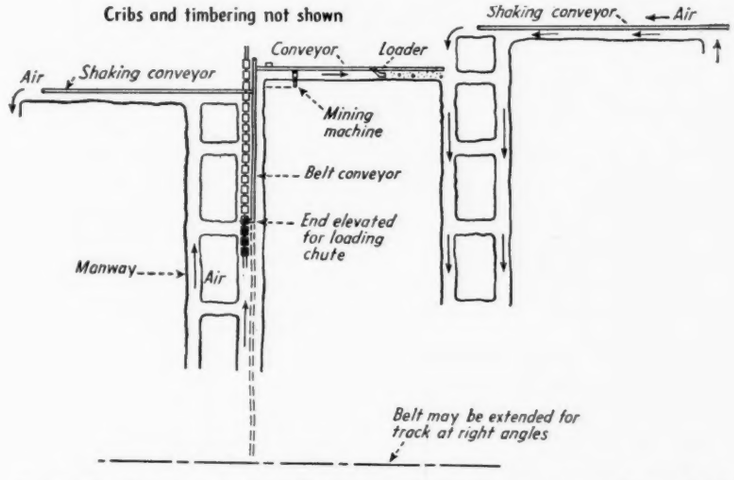



Fig. 8—Ventilation of a longwall face. Auxiliary fans are not needed. Panels are being drawn on retreat.

## Man Should Be Near Blower

Portable blower fans should be used only when men are working or someone is in attendance. If no air is circulating in the heading, the cutboss or car loader should be instructed to stop his blower fans and call for the fireboss. Without the blowers, stoppage of air by an open door or other cause may allow a pocket of gas to accumulate along the roof. This might be ignited and set off a dust explosion, so an experienced foreman or fireboss should be on hand if there is any probability that methane will be present.

Where blowers are used, gas pockets may be avoided, but the air will mix more completely, and it may even recirculate until it forms an explosive mixture, although the men at work may think that the air is all right because the fans keep it moving. If methane is likely to collect, the electrician should place near the crew member stationed on the heading a vane or other device which will turn and thus switch on a red light when the volume of air becomes subnormal. Thus, the men can be withdrawn and the fan stopped.

# MISSOURI SHAFT MINE

## Producing 400 Tons Daily

## Meets Market Demand Through Modernizing

By CHARLES LAMBUR, JR.
*Assistant Editor, Coal Age*

MODERNIZATION of Moberly Fuel Co.'s Ol' Elliott mine, Moberly, Mo., shows how the small mine can hold markets in a State where high-cost shaft operation has closed many of them. Opened in 1931 as a railroad mine making only lump, egg and slack with round-hole and bar screens, a four-track steel tipple replaced the original wooden structure in 1935. A 20-ton-per-hour washer erected in 1938 was replaced in 1939 with a 40-ton unit, where 40 to 50 per cent of the output is washed. Step screens now classify raw coal and trommel screens the washed coal. A total of eight sizes are made. Improved preparation is shown by analyses now averaging 9.66 per cent ash compared with 16.17 per cent for raw screenings. Five per cent of the output is sold locally and 95 per cent is shipped by rail.

With a force of key men from his worked-out truck mine, President J. C. Reighard began development in February, 1931, and in nineteen weeks was hoisting 206 ft. through the 16x 7-ft. creosoted fir-lined shaft from the 48-in. Bevier seam. The 65-ft. headframe, erected before shaft sinking, still is in use. The airshaft was sunk through surface earth and raised from the seam through the rock.

Room and pillar mining is used and production is from one panel at a time. The weak soapstone top must be well supported with props. Entries are top brushed 12 in. for working height. The seam contains a 1-in. hard dirt band 10 in. above the floor and is undercut 5½ ft. in the fireclay bottom. Bits are conditioned by a Sullivan sharpener which in two years' service has reduced replacement by one-third. Cuttings and rock are gobbed in the rooms.

Three holes per room and two per entry face are shot with ¾ to one stick of Atlas powder per hole. Coal is hand-loaded into 1¼-ton cars, pulled by ponies to a parting, and hauled 1,000 to 3,000 ft. to the shaft by a ½-in. head-and-tail rope by an Ottumwa double-drum 10-hp. motored hoist. Hoisting is by 1¼-in. Leschen rope on a 52-in. chain-driven straight drum operated by a 75-hp. General Electric motor.

Coal leaving the weigh basket is divided into 3-in. minus and plus by the main shaker. Minus 3-in. goes to the washery but may be bypassed for raw-coal loading. Lump and egg each are picked by two men on separate tables, and loaded by 25-in. chain-bar booms, or lump may be broken by a 28x24-in. adjustable single-roll 20-hp. motored United Iron Works crusher, and reclassified on the main shaker screens. Reject from the picking tables is broken to 1¼-in. by a 10-in. double-roll crusher operated by a 7½-hp. motor to enter then the washer feed.

Minus 3-in. is held in a 60-ton bin which feeds the washer, allowing its continuous operation if the raw-coal output is interrupted. When making stoker sizes the bin feed is passed over a $\frac{5}{16}$-in. square-mesh screen. Conveying equipment in the entire plant is chain-flight type.

The bin feeds through a Link-Belt gate to a flight conveyor, operated by a 5-hp. Westinghouse motor, to the washer. Washer unit includes a jig operated by a 7½-hp. motor through a speed reducer, refuse bucket elevator, settling tank and dewatering bucket elevator. About 15 gal. of fresh water is added per ton of coal washed.

The dewatering elevator takes washed coal to a trommel tapered-screen of 1 ft. to 3 ft. diameter 14 ft. long, driven by a 5-hp. motor. Half the trommel has 1-in. and the other half 1¼-in. square openings of Ludlow Saylor netting. It makes 3x1¼-in. nut, 1¼x1-in. pea, 1¼-in. screenings and 1x$\frac{5}{16}$-in. stoker sizes. Water sprays are to be added. Wedge wire dewaters stoker coal. By a chute arrangement, the 1¼x1-in. can be loaded with the 1-in. minus to make 1¼-in. screenings, or can be mixed by a chain conveyor with 6x3-in. raw coal for railroad-fuel use. A cold-oil pressure-spray treating system is being installed.

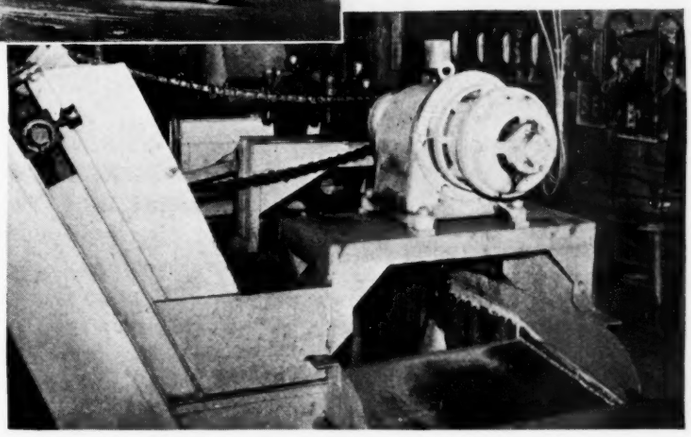
A 4-ton steel side-door dump car hauls refuse 300 ft. by one drum of a 12-in. double-drum hoist operated by a 40-hp. motor. The other drum spots railroad cars under the tipple.

All power is 250-volt a.c. and total connected horsepower is 372, of which 109.5 is for preparation. The use of steam was discontinued and four Locke "Warm Morning" 100-lb. stoves were installed for heating purposes. Fresh water supply is from a 1,200,000-gal. pond and is pumped 700 ft. to the washer. A 40-ton wood bin, fed by conveyor from the tipple, holds 8x3-in. raw coal for truck trade. Trucks are loaded by conveyor and weighed by a 20-ton beam scale. The truck and washery bins are equipped with Hall spiral loading chutes to minimize degradation.

In the summer the mine averages but 40 per cent working time with the force cut in half; however, 50 per cent of the miners own farms which they work in slack periods. An average of 90 men are employed underground and 15 on top in winter.

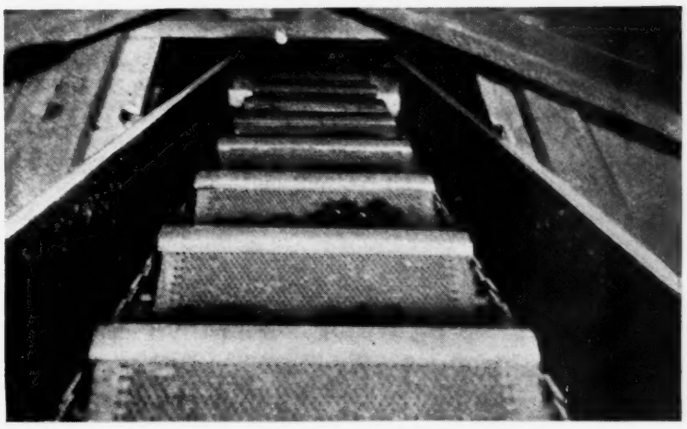
Top layout showing raw-coal tipple in rear and washery in foreground. At left are shops and at right the truck bin and office.

This 40-ton-per-hour washer cleans minus 3-in. coal.

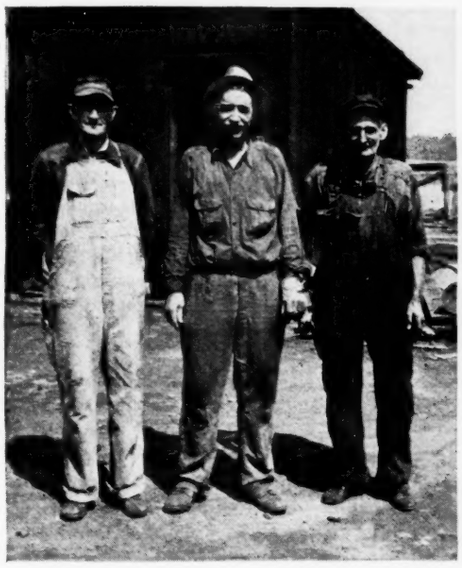


**What a shaft mine producing 400 tons can do to meet exacting market requirements is shown by Moberly Fuel Co. at its Ol' Elliott mine, Moberly, Mo. Opened in 1931, a steel tipple replaced the wooden structure in 1935 and a 20-ton-per-hour washer was erected in 1938. In 1939, this was replaced by a 40-ton-per-hour unit. Two crushers, a mixing conveyor, and stepped shaker, trommel and dewatering screens are among preparation facilities added to increase the original three-size output to eight.**

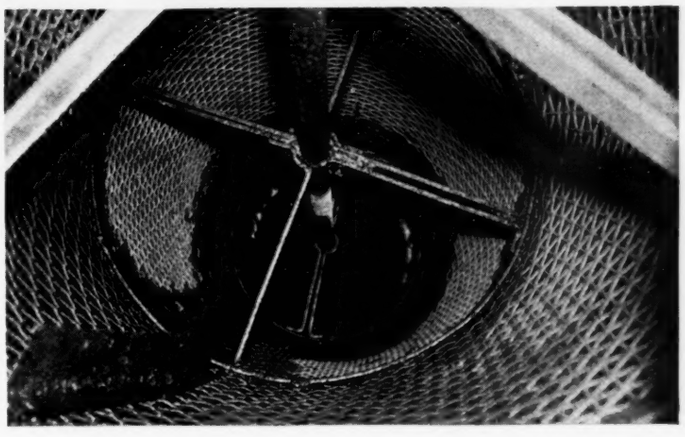
A dewatering bucket elevator carries coal from washer to trommel.



Interior view of washed coal trommel.



Three key men, Joe A. McKinney, top boss; Joe Donatti, superintendent, and Louie Wybert, shop foreman. These men and John Armorville, underground boss, and J. C. Reighard, president, are responsible for all development, designing and construction.



# IMPROVED PREPARATION

## At Modern Iowa Strip-Mine Plant

## Keynotes the 1,000-Ton-per-Shift Operation

**To meet discriminating market requirements in a State hard-pressed by competition, the National Coal Co., near Oskaloosa, Iowa, has featured product preparation at its recently opened Fosterdale mine. The all-steel plant contains many modern developments of efficiency and design and is capable of handling 37 sizes, although only 20 now are produced.**

SPECIALIZING in preparation, the National Coal Co. officially opened its Fosterdale (Iowa) strip mine last August with a new all-steel 1,000-ton-per-shift three-track preparation plant which is capable of making 37 different sizes. Preparation-plant facilities include shaking screens, mercury-lamp illumination for picking, electrical crusher adjustment, eleven motor-driven speed reducers, oil treatment, vibrators and silo storage for minus $\frac{5}{16}$-in.

The National Coal Co. was organized by President C. L. Rutherford in 1938. Prospecting shows at least 1,000,000 tons of the 5½-ft. Lower Cherokee seam available for stripping. Multiple-pit mining is practiced and overburden removed by two Page 220 diesel 3-yd. 90-ft, boom draglines which work in tandem on the highwall. Coal is loaded by a Bucyrus-Erie 33-B diesel 1½-yd. shovel.

Overburden averages 30 ft.; one half is shale and the other clay. Where shooting is necessary, sidewall drills make 4-in. holes loaded with 3x16-in. powder. Coal is drilled with 55-lb. jackhammers and shot with Hercules 1¾x8-in. pellet powder. The pit is kept dry by ditching on the highwall with a Sargent ¾-yd. dragline and two 4-in. and two 2-in. centrifugal self-priming gasoline-operated pumps.

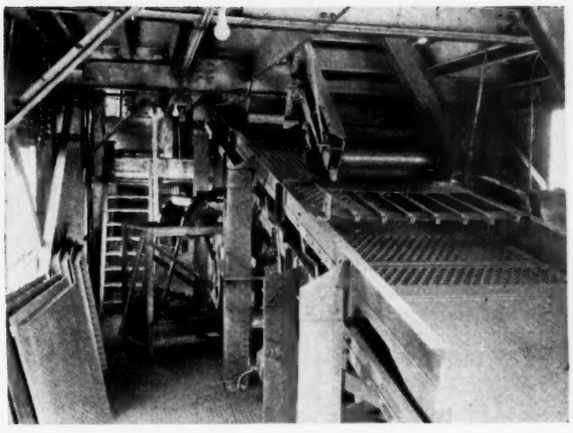
Haulage is on the fireclay by five Mack 7-ton and three Dodge 6-ton trucks via ramps of 6 per cent maximum grade. All of the trucks are contracted except a 3-ton unit used for auxiliary service. The present haul is 1¼ to 1½ miles and maximum will be 2 miles one way. Grading is done by a Caterpillar RD-7 diesel tractor with LaPlante-Choate blade and an Adams 10-ft. grader hauled by an auxiliary service Caterpillar-30 gasoline-operated tractor. Diesel fuel is Shell and is hauled to the draglines in a Caterpillar rubber-tired supply tank.

At least $3,000 of supplies always are kept on hand and repairing is done in a machine shop equipped with drill press, grind-wheel stand, portable electric welder, electric forge and acetylene welder. Explosives are stored in a 2½-car-capacity concrete powder magazine.

Trucks dump into a 175-ton hopper equipped with a reciprocating feeder emptying into a 48-in. run-of-mine conveyor which feeds the preparation plant at a rate of 100 to 150 tons per hour. A 5-ft.-wide shaking picking table and primary classifying screen receives the feed and at its upper end a 1-in. round-hole screen removes fines. This minus 1-in. goes to the main classifying screens. The plus 1-in. is cleaned by six pickers; however, there is room for as many as twelve. It is primarily sized at the lower end of the table by a 5x5-ft. (interchangeable by lifting out) 1-, 2-, 2½-, 3-, 4-, 5-, 6- or 8-in. round-hole screen.

The undersize can be fed into a Link-Belt 30x36-in. double-roll adjustable 2- to 8-in. crusher or onto the main shaker classifying screens. Oversize can drop into the same

New all-steel three-track 1,000-ton-per-day preparation plant with silo storage for minus 5/16-in.



Left—Shaking picking table and primary classifying screen with lump lowering conveyor in foreground. Note mercury lamps above picking table. Right—Main classifying screens and discharge end of lump lowering conveyor. Replacement screens to change size of output are along the wall.

crusher or, by placing a plate over its feed opening, enter a 28-in. flight lowering conveyor feeding onto the lower end of the main shaker classifying screens.

This main classifier may be made up of any combination of 1-, 1¼-, 1½-, 2-, 2½-, 3-, 4-, 5-, 6- or 8-in. 5x5-ft. round-hole screens—all interchangeable by lifting out. The simplicity of changing screens on both the primary and main classifier allows a varied output at a moment's notice. The prepared sizes can be loaded by the lump and nut booms onto track No. 1 and 2 or by chute to track No. 3.

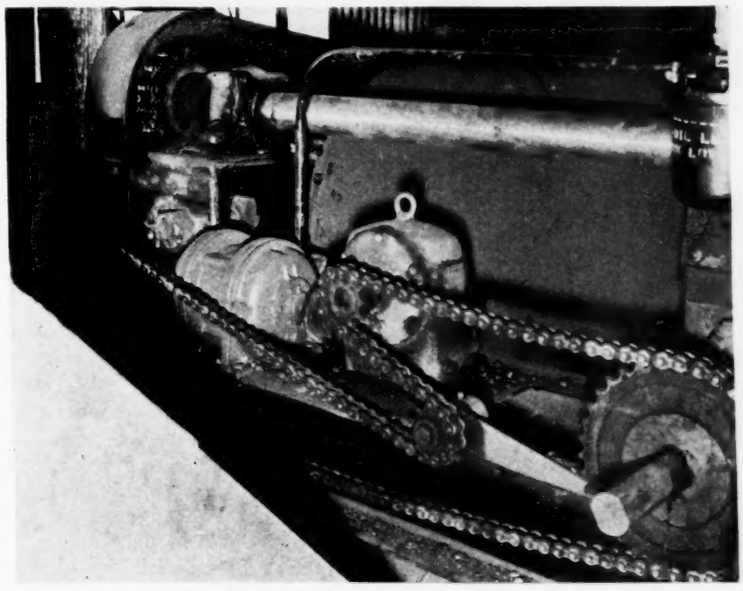
Before loading onto track No. 3 any size from 1- to 3-in. can be passed over a Symons 4x6-ft. double-deck ⅜-in. vibrator screen, operated by a 15-hp. motor. The bugdust (⅜x0-in.) is stored in a 300-ton concrete silo by a 20-in. scraper-type conveyor or may, by a 20-in. cross conveyor, be added to steam coal at No. 2 track boom. If the silo is full and there is no market for bugdust, it is loaded into trucks and stored in the open.

Reject from the picking table passes over a 30-in. reclaim apron-conveyor table where coal is broken from the rock by one or two men. This reclaimed coal is fed onto the run-of-mine conveyor by a 12-in. drag conveyor. The rock is crushed to 2-in. by a Cedar Rapids adjustable-jaw crusher operated by a 10-hp. motor, and is stored in a 15-ton bin to be used for road building.

The picking table is lighted by three Westinghouse mercury Type H-2 250-watt lamps with Alzak-process reflectors. Each has a transformer and is warmed by a 50-watt 120-volt Duro-Test lamp. The reclaim table is lighted by another of these units. As mercury light shows sulphur impurities best, daylight is kept off the table by tarpaulin roll curtains on the windows and skylights. Treatment is available at Nos. 2 and 3 tracks by an 8,000-gal.-tank Viking oil-spray system and the coal is sprayed at the end of the screens before going onto the boom or chute. The oil is 600-W, is at 140-lb. pressure and is electrically heated to 200 deg. F.

The 30x36-in. double-roll crusher is equipped with Link-Belt-Shafer self-aligning roller bearings and is driven by a 25-hp. motor. Crushing size is electrically controlled by a Link-Belt "mechanical roll adjuster" which has worm gears in oil and is operated by a 2-hp. motor through a 50 to 1-ratio speed reducer and oil switch. The dump-hopper feeder, run-of-mine conveyor, lowering conveyor, reclaim conveyor, double-roll crusher-adjuster, two silo conveyors, cross conveyor and two booms are chain-driven by motorized speed reducers (see Table 1). The reclaim table has pinion and gear drive. The picking table, main classifying screens, coal crusher, rock crusher and vibrator are V-belt driven. The lowering conveyor and booms are equipped with rivetless chain. Loading booms have car-changing chutes and are lowered and raised by 2-ton Shaw box-hoists protected from the weather by corrugated roofing.

The plant is operated from a central pushbutton-control panel with



This motor-operated adjuster sets rolls from 2- to 8-in. in the 30x36-in. double roll crusher.

Westinghouse magnetic reset switches. When out of coal the dump-hopper attendant, by means of a red light over the picking table, signals the power to be shut off. All wiring is in conduit and power is 440-volt a.c. except for lighting, which is 110-volt. All of the nineteen motors are General Electric and all of the eleven speed reducers are Link-Belt. Total connected horsepower is 125. The tipple is equipped throughout with Westinghouse emergency stop buttons. Meters and transformers are outside the plant and are owned by the Oskaloosa Power & Light Co.

Although a total of 37 sizes may be made, present demands are for only these 20: 8- and 6-in. chunks; 2-in. standard lump; 8x3-in. large egg; 8x2-in. small egg; 6x3-in., 6x2-in., 4x2-in. and 3x2-in. egg; 2x1¼-in. nut; 2x⅝-in. and 1½x⅝-in. prepared industrial stoker; 1¼x⅝-in. and 1x⅝-in. domestic stoker; 2x0-, 1½x0 and 1¼x0-in. crushed industrial stoker; and 2-, 1½-, 1¼- and 1-in. screenings.

**Table I—Salient Data on Motor-Driven Speed Reducers in the Preparation Plant**

| Equipment | Motor Hp. | Speed Reducer Ratio |
|---|---|---|
| 6-in. adj.-stroke dump-hopper feeder | 5 | 15.93 |
| 48-in. run-of-mine conveyor | 15 | 26.86 |
| 28-in. lowering conveyor | 2 | 11.43 |
| 30-in. reclaim conveyor table | 1½ | 195.7 |
| 12-in. reclaim conveyor | 1½ | 17.10 |
| 20-in. silo loading conveyor | 7½ | 17.10 |
| 20-in. silo emptying conveyor | 5 | 17.10 |
| 20-in. cross conveyor | 5 | 17.10 |
| 28-in. loading booms (two) | 5 | 14.0 |
| Double-roll crusher-adjuster | 2 | 50.0 |

Plant capacity is 100 to 150 tons per hour and track facilities are 35 empty and 55 loaded cars. The storage and passing track holds twenty cars. Daily average output is twenty cars. Grade under the tipple is 2 per cent and cars are spotted by three Brownie RA retarders. Operation is for a single shift by a crew of thirteen employees, including: one dump-hopper attendant, six pickers, one reclaimer, one trucker for rock, one car dropper, two car trimmers, and a foreman. The mine employees total 50. Output is weighed by the railroad.

The plant was designed and erected by Link-Belt. It is all-steel on concrete foundations and contains steel checker-plate floors and corrugated siding. Water from a 120-ft. well at the bottom of the raw coal hopper is pumped at 40 lb. pressure in ¾-in. pipe throughout the building to seven drinking fountains and faucets. Heat is furnished by a special No. 2500 Holland hot-air furnace and to assure unfrozen feed a small Mogul coal stove is under the raw-coal hopper. Another small stove below the silo prevents freezing of its emptying conveyor.

# TWO-WAY "RADIO" SETS

## Used by Maureen Coal Co.

## At Fractional Cost of Standard Phone System

By IVAN A. GIVEN
*Associate Editor, Coal Age*

GOOD COMMUNICATION between mine and outside at but a fraction of the cost of a standard telephone system has been attained by the installation of two-way "radio" sets at the Cliff mine of the Maureen Coal Co., Spelter, Harrison County, W. Va. These "radio" units, which utilize the 250-volt trolley system for carrying high-frequency waves and therefore require no auxiliary wiring, are equipped with both earphones and loud speakers for voice reception. The same loud-speaker diaphragms also serve as transmitters.

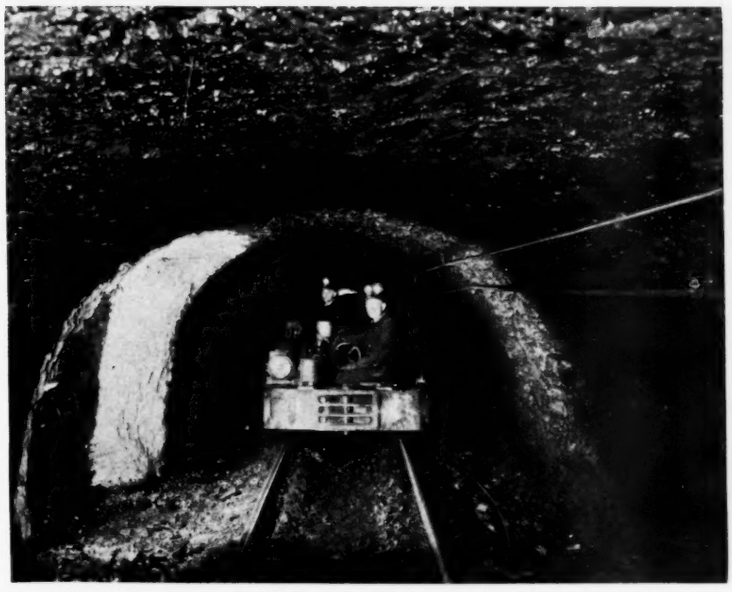
Installation of the high-frequency communication system took place in March, 1939. One set is stationed permanently in the shop at the mine portal while the other usually is kept in the mine foreman's shanty, two miles underground, during working hours, being taken in in the morning and brought out at night. Each set, supplied by the Safety Stemming Plug Sales Co., cost the coal company $95. At the time the mine was visited by the *Coal Age* representative the original tubes still were in service and the only repairs had consisted of the replacement of a resistor costing less than $1 in one unit.

Cliff mine is a drift operation producing 800 to 1,000 tons daily from the Pittsburgh seam. One locomotive operates over the two-mile haul from the working territory to the outside. A new main line (70-lb. steel—Air Reduction system bronze-welded joints) was being completed when the mine was visited. On curves, the bronze welding is supplemented with the usual angle bars, even though joint breakage is not expected. However, in the unlikely event of a weld

giving away, the angle bars will be there to prevent a wreck.

### Top Coal Protection

To accommodate the new main line, which parallels the original main, a new opening has been driven from the old portal. This was done because deterioration of the top coal in the old opening had exposed the drawslate for long distances, with resultant substantial increase in trouble from falls. Top coal also has been left to protect the new opening, with the difference that shooting against it was entirely eliminated. This was accomplished by limiting the use of explosives to that part of the seam below a band about 4 ft. up from the bottom. With the bottom bench shot down and loaded out, the top part of the heading was cut with picks to make the total height some 7 to 7½ ft. The pick work was conducted to form an arch, as shown in an accompanying illustration, thus adding that much to the strength of the top coal left to support the drawslate and other overlying material. Finally, as no shooting was done against the top coal, its maximum strength has been preserved, with consequent expectation of a materially longer period of effectiveness.



Pickwork in the upper part of this new haulway preserved the strength of the top coal and results in the arch effect. The trolley wire at the right is the communication medium at Cliff.

The need for some form of communication other than messages carried by the motorman and the like had been felt for some time prior to the installation of the high-frequency equipment, and a decision had about been made to install a telephone system in spite of the cost. Upon hearing of the "radio" equipment, however, the management immediately decided to give it a trial. When the units were received, one was installed on the haulage locomotive with the other in its permanent location in the shop.

Left—Superintendent A. F. Rodeheaver demonstrates the use of the earphone on the mine set. Right—Showing the works in the mine "radio" set. A battery clamp permits connection to the machine line, with a similar clamp on the regular track return.

The outside "radio" set is permanently located in the Cliff shop, where the smith always is available during working hours to receive communications.

The locomotive installation was made for two major reasons: (1) to determine the effective distance over which the system would operate and (2) to locate any bad spots in the trolley system. A reasonably good trolley or other d.c. system is necessary for most efficient operation of the sets, as heavy grounds to hangers, bad splices and the like result in considerable interference. Because of this characteristic, incidentally, the communication units provide instant evidence of bad circuit conditions. At this point, perhaps, it might also be stated that the units are designed to utilize either a.c. or d.c. circuits for transmission of the high-frequency waves.

In addition to demonstrating the complete feasibility of using the equipment on locomotives for constant two-way communication between motormen and any other point, the initial installation proved that the system would operate efficiently over much more than the desired distance and that the trolley system was in good shape for its rôle as a wave carrier. The one set then was taken off the locomotive for use in the foreman's shanty in transaction of the regular mine business. As previously stated, this set normally is taken in in the morning—by the mine foreman—and brought out at night, although it, of course, is available to any other employees who may need it at other than the regular working hours.

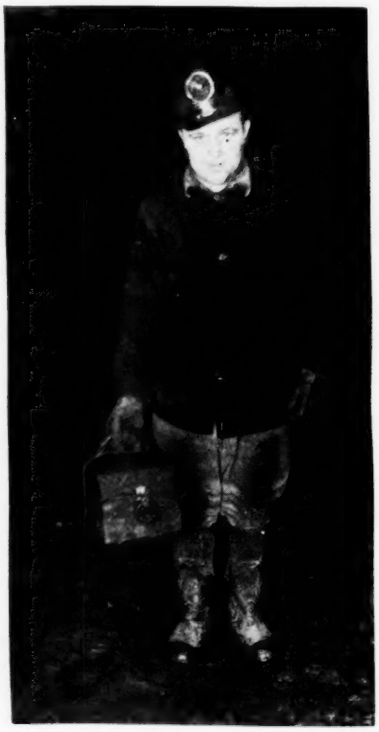
The sets comprise principally standard radio parts, including tubes and speakers. Operating power at Cliff is supplied through a resistor by the same trolley system or machine circuit that carries the high-frequency waves. This resistor is set for the average voltage expected and thereafter the sets normally operate without further adjustment on this score. In particular, lower-than-normal voltages apparently have little effect on operation, in the light of experience at Cliff. The outside set, being permanent, is fitted with permanent connections. To make the portable set used in the mine ready for operation, it is connected to the trolley or machine line by means of a battery clamp, with a second clamp to the return. Then, as soon as the tubes warm up, it is ready for duty. Each cabinet contains a complete receiver and transmitter.

### Party-Line Principle

The sets include tuning adjustments, so that their frequencies may be synchronized, and also condensers to elminate interference. When two or more sets are tuned to the same frequency, anyone can talk to or receive from all the others on the party-line principle. By using sets of different frequencies, conversation between the central station and one set cannot be picked up on any of the others. As the communication problem at Cliff could be met with the simplest type of system, only two units, both having the same frequency, were installed.

While the system is not so used at Cliff, inasmuch as only one locomotive is in service, the management is of the opinion that one of the biggest fields for equipment of this type is in service on locomotives, not only those hauling coal but locomotives or other transportation equipment used by electricians, supplymen, inspectors or others who customarily move around underground and sometimes must be located quickly. As a unit is cheap and can be connected up ready for operation in a minute, it is felt that it lends itself very well to such portable service.

Since the system requires no auxiliary wiring, communication is not subject to interruptions resulting from falls, shorts, moisture and other factors adversely affecting the usual telephone circuits. As long as there is power on the d.c. or a.c. circuit, the sets normally will continue to function, although, of course, a breaker outage or a break in the line will put them out of service until the fault is remedied. As the tubes constantly produce heat while operating, the sets are not affected by moisture. Also, they stand severe handling and jarring. All in all, as long as a reasonably good circuit and power are available, Cliff has good communication.



Thurman Hornor, foreman, shows how "radio" unit is strapped up for moving.

# RESISTANCE WELDING

## Lessens Shaking-Pan Repairs

## At Hudson Coal Company's Anthracite Mines

RESISTANCE welding has been used by the Hudson Coal Co. in the Northern Anthracite Field since June, 1939, for placing the needed attachments on shaker chutes so as to reduce repairs and extend the life of these units. At the extensive Providence repair shops of the company, all its shaker chutes are supplied with the necessary attachments and all repairs made. Scrapers and pumps also are repaired, flattened car-wheel treads are filled by electric welding, armatures and field coils are rewound, and the bearings for rotary parts cast in the foundry.

Fig. 1 shows the standard chute with accessories as it was constructed when rivets were used to put the several parts together. It will be noted that the accessories are the $\frac{3}{8}$-in. lug straps and the $\frac{3}{16}$-in. gussets, on the underside of the pan at either end of the same, and a T-iron, centered 30 in. from the rear end of the pan for connection with the ball frame. Each lug strap comes already bent to form a lug on either side of the pan, through which bolts are passed to fasten each pan to the one adjacent.

Strength at the end of the pan is even more necessary now that duckbills are used, which may become wedged more or less under heavy masses of coal or may collide with roughness of the floor. The lug strap gives the pan strength just where it has to endure the worst punishment.

It has been the custom hitherto to attach the accessories to the pan by rivets which were found to work loose even when, as will be seen in Fig. 1, the rivets were not only countersunk at the ends of the trough but the taper of the countersink was extended into the lug strap below the pan $\frac{1}{4}$ in. so as to increase the hold of the rivet. This is what is known as "dimple riveting."

But, do what might be done, loose rivets would be found as a result of the sudden stress reversals which are the essential characteristics of the operation of a shaking chute, so, for a while, the pans were arc-welded, but that proved expensive. In consequence about eighteen months ago, spot, or resistance, welding with a Thomson-Gibb resistance electric welder was introduced in order to reduce the labor and skill needed to make the connection.

Extensive tests had to be made to adapt this form of welding—normally confined to relatively thin plates of equal thickness—to the more difficult jobs of uniting three plates, one $\frac{3}{16}$ in., one $\frac{3}{8}$ in. and one $\frac{1}{8}$ in. thick. This combination is not favorable for the making of such a weld because the two thin exterior plates, and especially the trough, become abnormally heated, and the thick plate between them remains relatively cool.

However, after experiment, it was found that with two applications of pressure and current a good weld could be made. With the first application there still might be air gaps and slag intrusions, but with a second, made only a few seconds later,

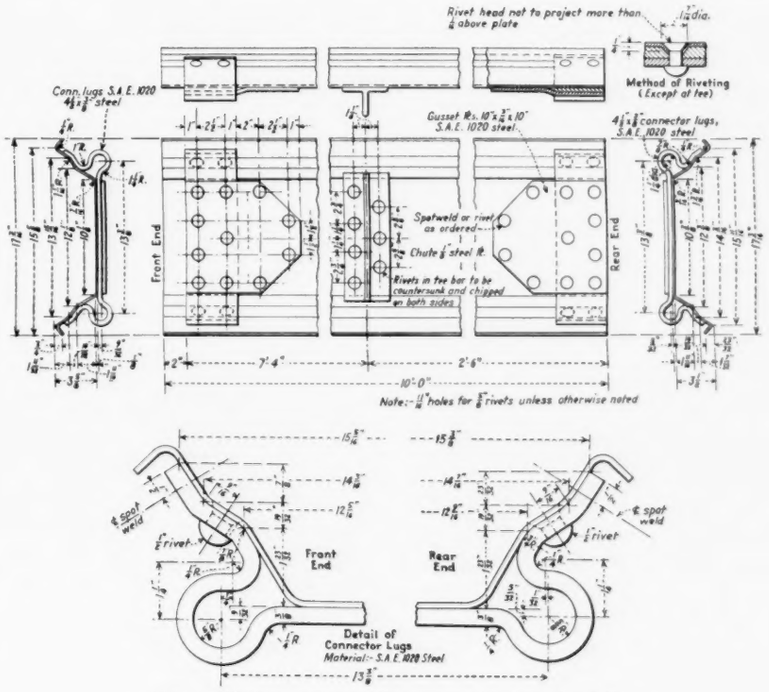

Rivet head not to project more than ¼ above plate
Method of Riveting (Except at toe)
Conn. lugs S.A.E. 1020
Gusset Rs. 10"x⅜" & 10" S.A.E. 1020 steel
4½"x⅜" connector lugs, S.A.E. 1020 steel
Front End
Rear End
Spotweld or rivet as ordered
Chute ⅜" steel lt.
Rivets in toe bar to be countersunk and chipped on both sides
Note:- 11/16" holes for ⅝" rivets unless otherwise noted
⅜ spot weld
⅜" rivet
Detail of Connector Lugs
Material:- S.A.E. 1020 Steel

Fig. 1—Shaking-pan specification of Hudson Coal Co.

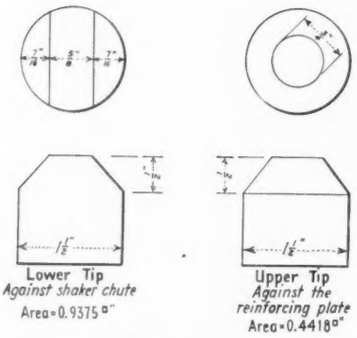



Fig. 2—Electrodes used for resistance welding.

while the metal was still hot and flexible, the air gaps could be closed and the slag squeezed out.

A preferable method might be to make several applications of pressure and electrical energy as a blacksmith strikes the steel several times and sometimes reheats it in his effort to beat out all air gaps and squeeze out all the slag, but that was not necessary or desirable in this instance. During the second application of force and electrically applied heat, the necessary adhesion seems to be achieved.

In resistance welding, the plates to be attached are held together tightly between two copper electrodes under heavy mechanical pressure, and a large electric current under low voltage is passed through the plates for a short period of time. In this instance, the average gripping force is 8,000 lb., applied by a spring-cushioned piston working in an air cylinder with a solenoid-operated valve controlled by a treadle switch. The electrical potential is 6.25 to 13.7 volts and the current is varied, by a lever adjustment with sixteen separate electrode heating points, to suit the temperature desired, which in turn depends on the type of weld required. The current will vary from 18,250 to 40,000 amp., for the capacity of the machine is 250 kva. The primary voltage is 440 single phase, and primary amperage at normal rating is 568. The lower voltage and higher amperage are very seldom used.

The electrodes are as shown in Fig. 2, but it must be remembered that, for welding, the pan is turned over so that the lower electrode is held against the pan and the upper electrode against the gusset, or reinforcing plate. In each case, the full diameter of the electrode is not in contact until there has been a degree of penetration.

Voltage and current are maintained for 30 to 36 cycles or from 1.2 to 1.44 seconds, as the current generated at the Hudson mines is of 25-cycle type. During the making of an arc weld, a brilliant discharge of sparks may be noted, flying in every direction, but such sparks have little body and therefore usually, though not always, burn away harmlessly, but with resistance welding the electrodes sink into the materials being welded and, for this reason, the sparks are associated with larger blobs of metal and

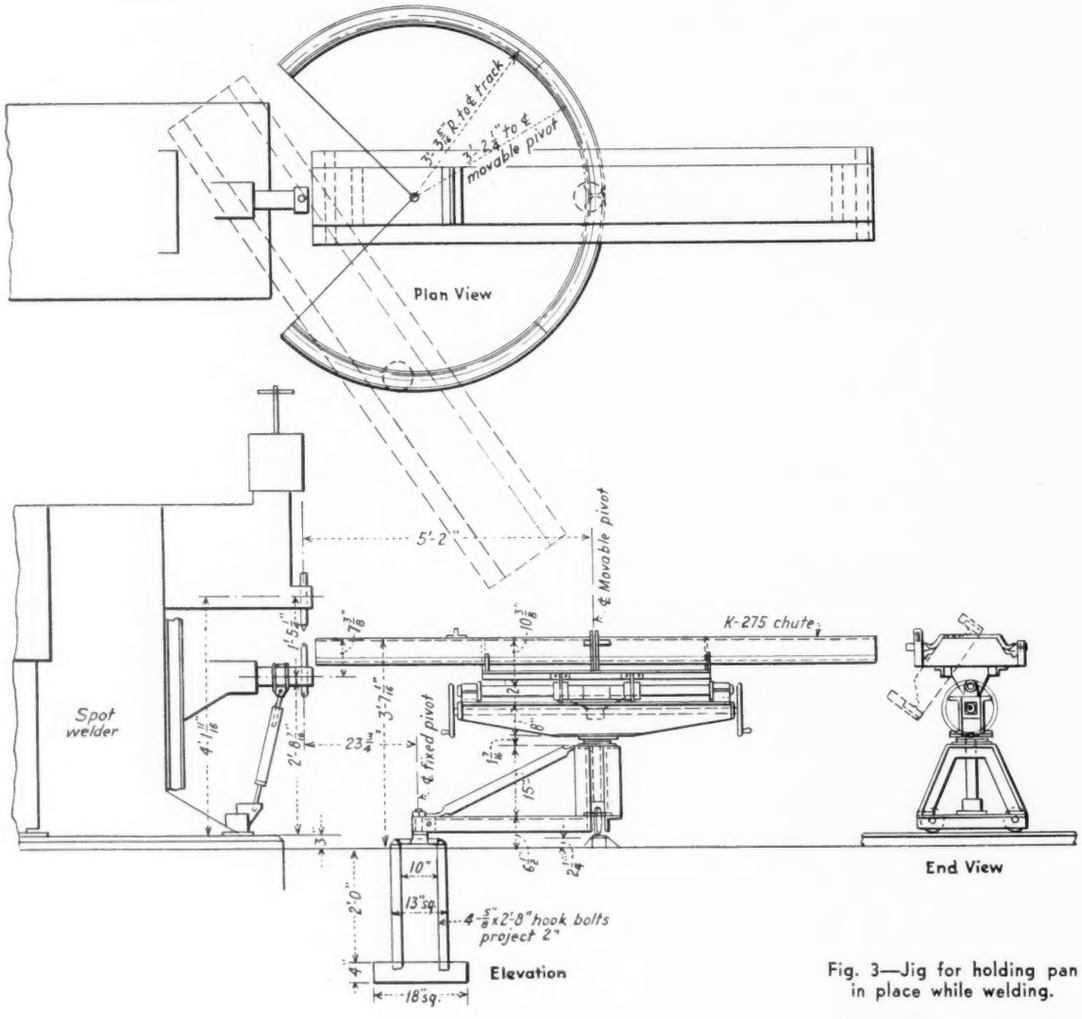



Fig. 3—Jig for holding pan in place while welding.

consequently if they should fall on anyone they will cause more severe burns and the more readily will start fires.

Therefore, asbestos curtains between machine and welders must be provided to afford the latter adequate protection. However, with proper precaution, there is absolutely no danger and the low voltage makes resistance welding almost hazard-free so long as care is taken. The firing propensity, moreover, involves little danger, as field welding is not attempted.

Because, with resistance welding, force has to be used to make the welded surfaces join, there also is the disadvantage that the pieces to be welded must be taken to the welding unit instead of the electrodes being taken to the work as it lies on the floor of the shop as in ordinary arc welding. To this end, a jig, or stand, Fig. 3, revolving on a vertical axis has been devised and constructed at

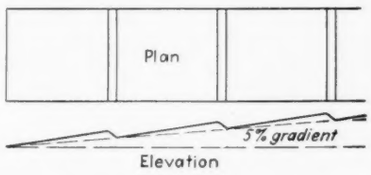



**Fig. 4—Truffle, or serrated, plates carry coal up 5 per cent gradient.**

the Providence shops carrying another smaller jig, which tilts on a horizontal axis. On this, the trough to be welded can be mounted, being tipped so as to permit of spot welding at any angle and being revolved end for end so as to bring the ends successively under the electrodes. In this way, the work when on the jig can be easily and satisfactorily spotted by one man, though two men are employed, for they are needed when the trough has to be lifted onto or removed from the jig.

In changing over from riveting to spot welding, the only revision has been to put spot welds in the design where rivets formerly were located except that no spot weld is provided in place of the rivets near the lugs on either side of the chute. Instead, spot welds are placed in the two positions indicated in Fig. 1 further beyond and above the lug.

Today, all pans received from the factory by the Hudson company have their accessories attached to them at the Providence repair shop by resistance welding, but when, owing to the presence of rust and scale, these resistance-welded pans have to be repaired, they have to be arc-welded, for resistance welding can be done only with clean material. To prepare old equipment for such welding, preliminary sandblasting would be necessary.

Shaker-conveyor troughs fail from many causes: (1) From buckling, when the string of troughs is too long and heavy or when the end of the trough or the duckbill strikes too heavy a piece of coal, a protuberance in the floor or the solid face or rib. (2) From twisting, when a connecting bolt between pans is omitted so that all the strain is thrown on one side. (3) From bashing, when roof or coal falls or is shot down onto the trough. (4) From shearing of pans at rivets or welds. (5) From fatigue of the metal. (6) From excessive wear against bottom or sides. (7) From rust or other corrosion. (8) From rough handling in mine cars or while being piled for later use or when thrown forward by the miner in delivering the pan either to the coal face or to the loading point.

The last type of injury is not important if the troughs are strong enough for other purposes; and, in a low place, working on his hands and knees, the miner hardly can be expected to be gentle with the pans.

But in this list are many causes of injury more frequent and less excusable than the last and the result of carelessness, indifference or lack of knowledge of the fundamentals. Hence a check is being kept on all troughs. Each is numbered and that number is stamped on a steel plate welded to the trough, so that every detail of its history can be checked from the record and needless violence

**Cost Data on Shaker Chutes at Providence Shops**

(Latest 1940 Costs—Oct. 30, 1940)

| | |
|---|---|
| Bare pan, K-275 | $3.35 |
| Connecting lugs—2 @ $0.70 | 1.40 |
| Gusset plates—2 @ $0.19 | 0.38 |
| Tee bar—1 @ $0.21 | 0.21 |
| Total for bare pan and accessories | $5.34 |
| **Fabrication Costs on Arc-Welded Pan** | |
| Labor, per chute | $0.65 |
| Material (rods, etc.) chute | 0.11 |
| Shop overhead | 0.34 |
| Total labor, material and overhead on arc-welded chute | $1.10 |
| Total cost of arc-welded chute=$5.34+$1.10=$6.44. | |
| **Fabrication Costs on Spot-Welded Pan** | |
| Labor, per chute | $0.36 |
| Material | 0.00 |
| Overhead | 0.20 |
| Total labor and overhead on spot-welded chute | $0.56 |
| Total cost of spot-welded chute=$5.34+$0.56= | $5.90 |

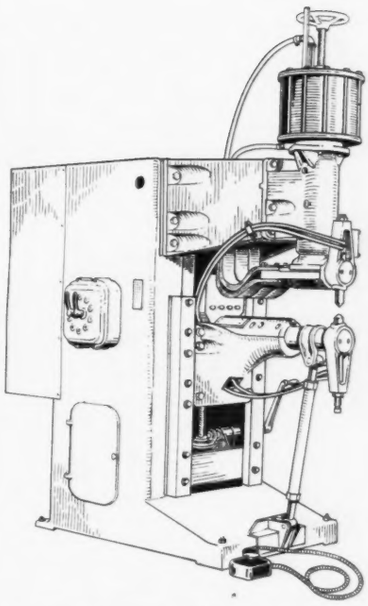


**Fig. 5—Resistance welder at Providence repair shops.**

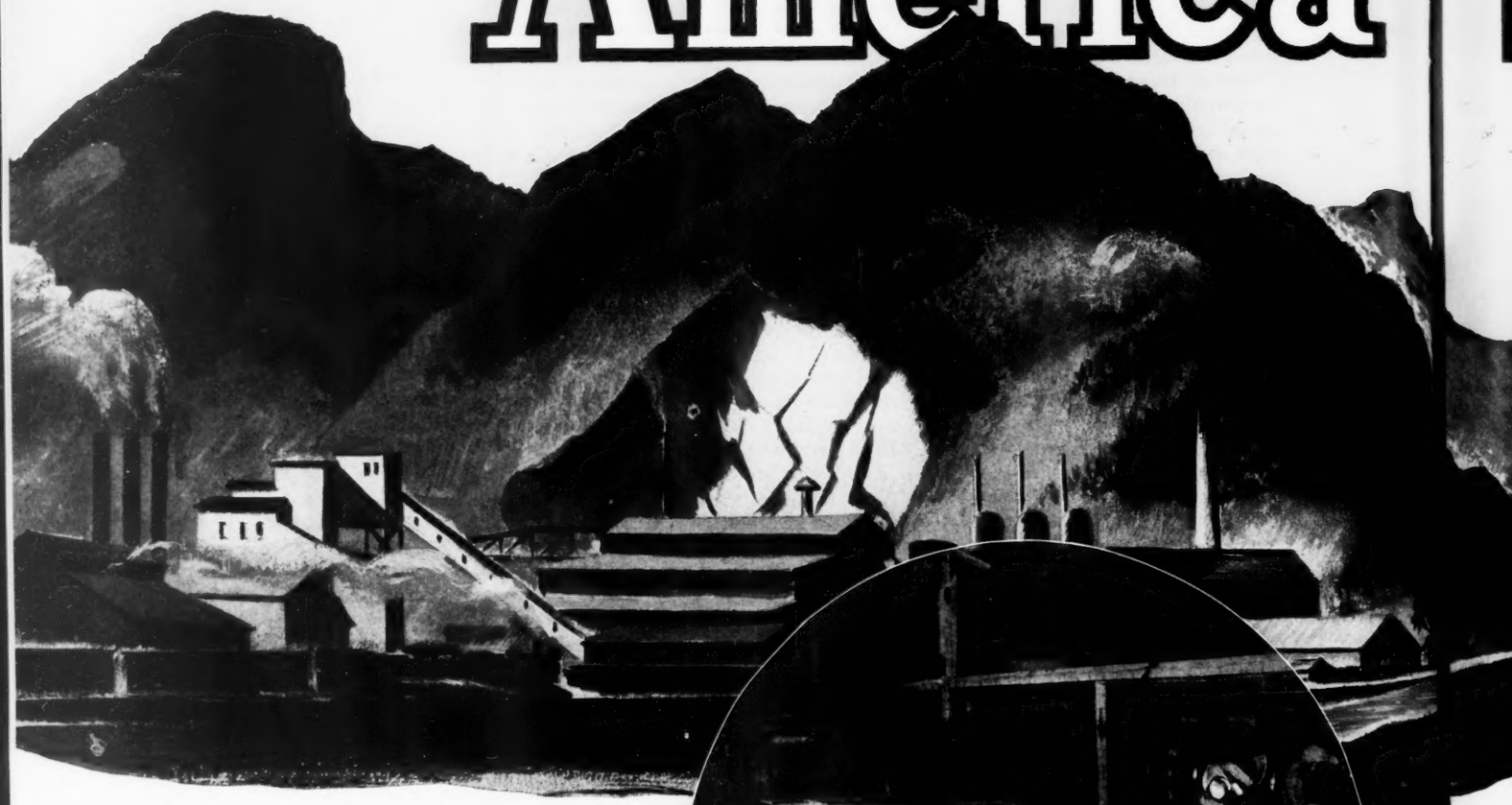
charged against the violator—workman or management. The shape of the injury—whether the trough is buckled, twisted or bashed—usually is easy to determine. Such information is valuable also as a means of deciding how much a trough may be extended, how heavily it may be loaded with certain pitches and loading methods, how strains are related to nearness to drive and other factors.

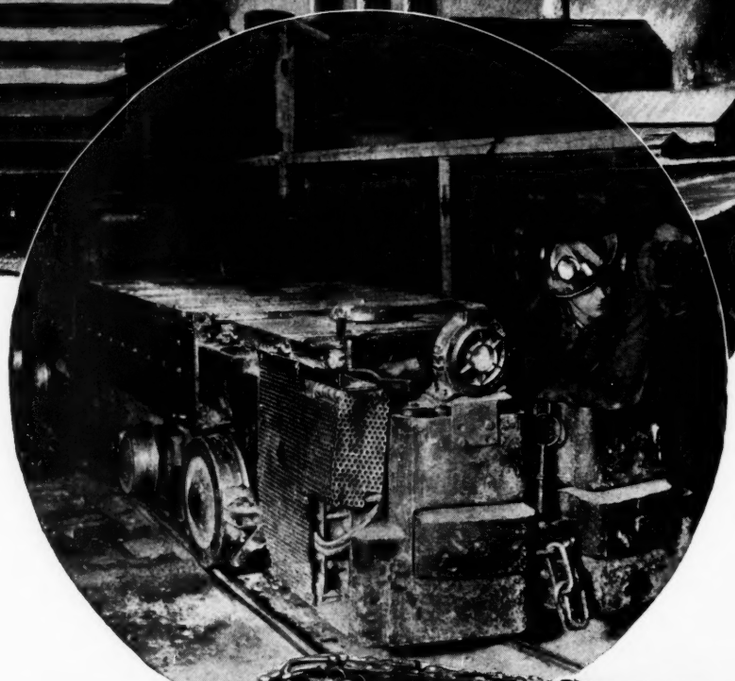
At Providence, troughs, if merely bent, usually are straightened in a few minutes by a Chambersburg 1,500-lb. air hammer with the aid of dies. It costs an average of 90c. to recondition a trough in this manner and make it ready for reuse.

On the steeper gradients, a long "truffled," or serrated, plate is laid in the trough bottom and arc-welded to the trough on either side (see Fig. 4). Coal can climb readily up these sawlike plate surfaces despite an adverse gradient of 5 per cent or less. On the backward pass of the trough, the coal slides up the easy inclination of the toothed incline until it falls over the point of the tooth.

It may go even further, but when the trough travel reverses and goes forward, the coal finds a tooth point behind it that prevents it from backsliding. On the trough again reversing and going back, the coal starts up the next inclination or inclinations and again drops over one or more tooth peaks. It has been found that riffles, or saw teeth, are more effective than spot-welded excrescences on the bottom of the trough.

# America





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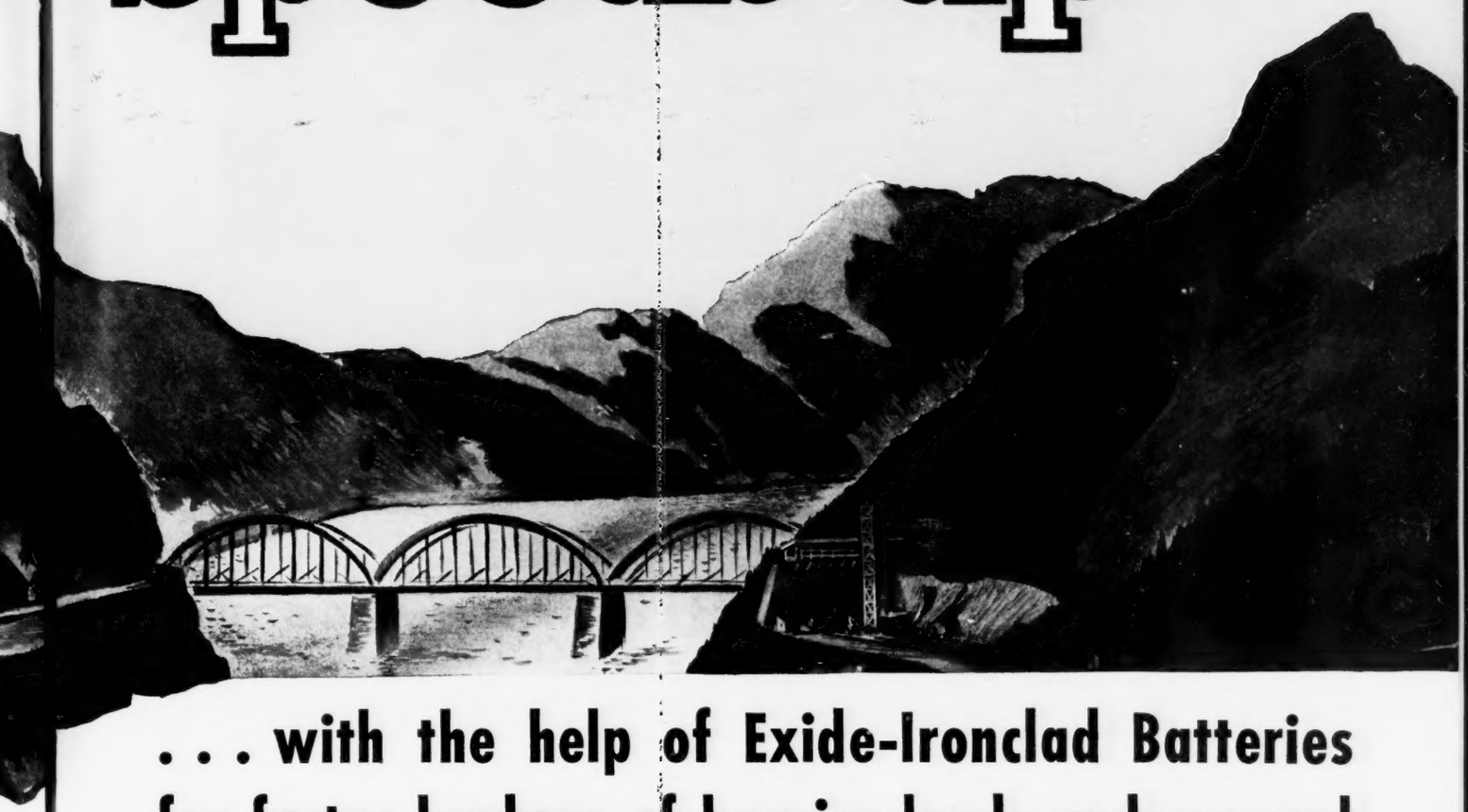

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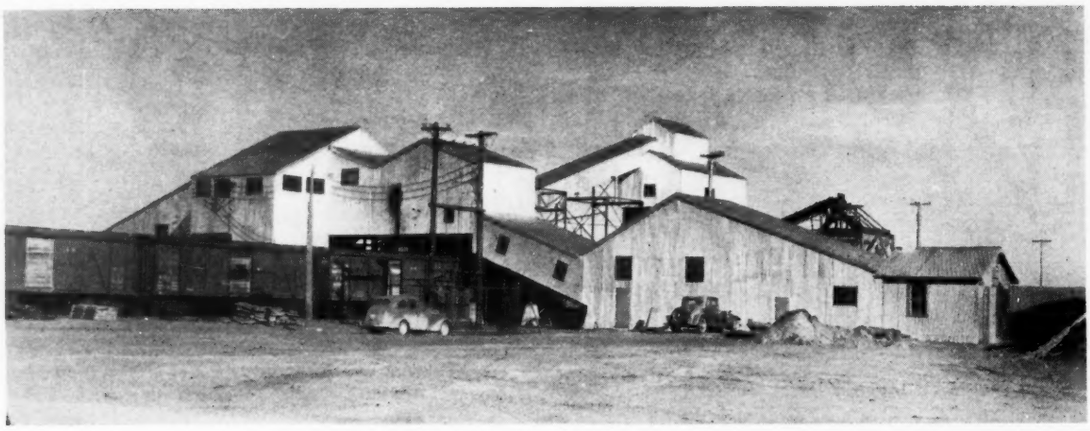


Tipple at mine of Western Dominion Coal Mines, Ltd.

# STORAGE OF UNDISTURBED COAL

## Assures Saskatchewan Company Full Tonnage to Meet Winter Demand

By R. DAWSON HALL
*Engineering Editor, Coal Age*

HARDLY any more desirable way of holding coal preparatory to shipment can be devised than that of uncovering it in the bed awaiting only a shovel to load it into the transportation units that are to deliver it to the tipple. In the Saskatchewan Province of Canada, which lies just north of the Dakotas, there is little demand for coal except in the winter. In this Province, which is devoted mostly to farming, with almost all industrial establishments at a considerable distance, it is necessary for the operator in the winter months to have coal available for quick transport. To produce the tonnage needed during cold weather without preliminary stripping it would be necessary to have an immense mine with several large strippers—an expenditure that would not be justified.

Uncovering a large area as a year-round task, working three shifts daily, along such an extended front that enough coal for a winter's use can be allowed to lie uncovered without hampering the operation of the stripping shovel is the solution of the problem as reached by the management of the Western Dominion Coal Mines, Ltd., of Bienfait, after lengthy experience on both sides of the international line, an experience that has fully justified the company's conclusions. The snows are not so deep at any time in the winter as to prevent trucking, and it is the practice to lift the roads to the level of the even terrain so that they will be cleaned by the winds and not fill with blown snow. Thus the main difficulty with snow is found in the stripping itself.

Coal in place is not subject to fire, degradation or oxidation but comes to market much as it would if separately extracted from the ground to meet every day's sales. Arriving at the tipple, the coal, of course, is crushed and screened.

Buried under an overburden of 10 to 60 ft. of material, the coal under the three sections owned or leased by the company has been tested by holes sunk at intervals, so that on every 40 acres one such test has been made. Some of these were test pits going down through the seam and some were churn-drill holes from 3 in. to 2 ft. in diameter. The coal rolls considerably, both in roof and floor, usually without any variation in its thickness, which averages 6½ ft. These rolls do not interfere with coal haulage, for, as the coal is soft, a bulldozer readily moves the hillocks into the holes, leaving an even gradient for the tractors.

Overburden is removed by a 10-cu. yd. Bucyrus-Erie 320-B shovel with a 58-ft. dipper stick, making a long fur-

row which follows the outcrop but is located a short distance from it. The average thickness of the cover has been a little more than 20 ft.

At intervals of less than half a mile, entrances are made by inclines cut from the surface of the plain down into the pit so as to permit the passage of tractors. Sand, clay, limestone and sandstone, some of which is glacial till, are the materials that have to be moved; no cross-section could be made that would be representative, for there is no approach to stratification, and the nature of cover changes rapidly. Overburden need not be shot, except where particularly hard limestone is encountered; the shovel is fully able to excavate the material without preliminary loosening.

After the overburden is removed, the coal is cleaned and smoothed by bulldozers and, when the time comes to load it, it is shot with black powder and loaded direct by a loading shovel. All equipment used was secured from an abandoned stripping at Estevan. Two loading shovels are available: one is a Bucyrus-Erie 42-B 2¾-cu. yd. shovel; the other, a Bucyrus-Erie 50-B 3½-cu.yd. shovel which for a while was used as a hoist in the construction of the tipple. All the shovels are electrical with caterpillar mounting.

## Roads Are Oiled Twice

The lignite contains about 4.5 per cent ash. It is loaded into six Euclid 6-cylinder diesel trucks and hauled to the tipple. Each road received two coats of oil. The nature of the soil is so favorable and the country so dry that the usual difficulties in road maintenance are not encountered.

Coal is brought to the tipple by the Trac Trucks which travel up an inclined road so that each passes over one of two openings in a 100-ton hopper. The driver opens the bottom of the tractor and drops the coal into the hopper, from which its escape is regulated by a reciprocating feeder which passes the coal to a 72-in. apron conveyor, 80 ft. long between sprocket centers. Here the coal is delivered to an adjustable McNally-Pittsburg 42x72-in. double-roll breaker where it is reduced to the required maximum size—usually 8 or 10 in.

A 48-in. troughed-belt conveyor, 104 ft. long, then lifts the coal to the head of a 10-ft. shaker screen perforated with 4-in. round holes in the upper deck and 2-in. round holes in the lower deck. The plus 4-in. coal discharges onto another screen with 8-in. perforations, the reciprocations of which are arranged to balance those of the first screen so as to reduce vibration. The plus 8-in. coal travels to a short steel apron conveyor, 48 in. wide and 11 ft. long, and is delivered by chutes to an Ottumwa box-car loader.

This same coal can be delivered through a gate to a 48-in. inclined apron conveyor which drops it into a 60x36-in. adjustable Robins double-roll crusher by which it is reduced to 2-in. This crusher discharges onto a 42-in. apron conveyor which in turn deposits it onto the 48-in. belt conveyor which already has been described as receiving the coal from the breaker. In this way, if there is more plus 8-in. coal than the market will absorb, it can be broken down to smaller sizes and screened for the market.

## Loaded Into Box Cars

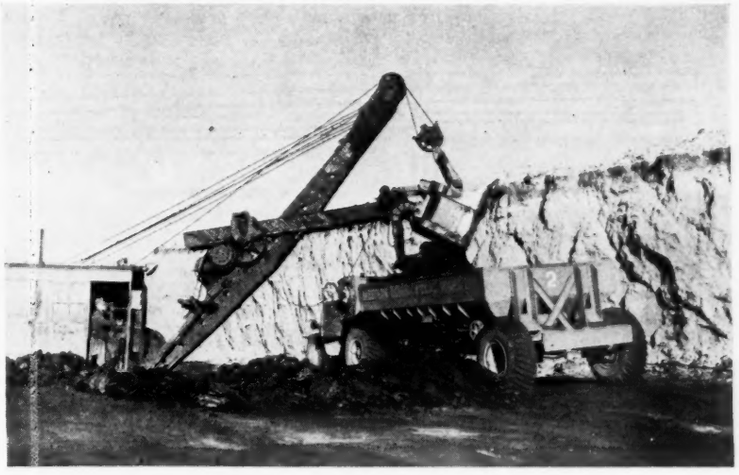
The 8x4-in. coal is discharged sidewise from the screen to a 5x11-ft. shaker screen which removes degradation. Here the coal is delivered on both sides of screen by chutes to Ottumwa box-car loaders. This 8x4-in. coal can also be crushed in the same unit as reduces the plus 8-in. coal and is sized like that coal by passing it to the top of main shaker. A gate in the main shaker screens provides for the mixing of the 8x4-in. coal with the plus 8-in. coal to make plus 4-in. coal. The 4x2-in. coal also is delivered sidewise from the main shaker onto a 24-in. belt conveyor which discharges in turn by a chute into a box-car loader. This same coal also can be loaded into gondolas directly from the main screen. If necessary, it can be put through the crusher by the means already described.

Minus 2-in. coal is delivered from the main screen to a 30-in. belt which discharges onto an inclined belt of the same width which, in turn, delivers the coal to 5x8-ft. Plat-O screens. The minus 2-in. also can be mixed with the 4x2-in. and shipped as minus 4-in. The Plat-O screens prepare 2x1-in., 1x¼-in. and minus ¼-in. sizes. Minus ¼-in. coal from the Plat-O's is discharged to a 24-in. scraper conveyor which carries the coal to a separate 30-ton bin for loading by chute. The 2x1-in. coal goes to a 60-ton bin and the 1x¼-in. to a 35-ton bin or both these sizes can be again brought together. Both the last two sizes are loaded by box-car loaders.

## Control From Central Point

Motors throughout the plant are started and stopped from a central point or control station. All motors can be stopped also from several points throughout the tipple. A.C. power at 22,000 volts is received from the Dominion Electric Co., at Estevan, and is stepped down to 220 volts a.c. for power and 110 volts a.c. for light. The shovels receive 4,000 volts a.c. and convert to d.c. of different voltages.

The plant was designed and erected several years ago by the Manitoba Bridge & Iron Works for the stripping plant at Estevan, and on removal to the present site was redesigned for greater flexibility and capacity. When it reaches its stride it will produce about 3,500 tons daily on one-shift operation. It is the intention to have 150,000 to 200,000 tons of coal uncovered at the beginning of each winter.



Loading coal at strip pit into motor truck.

# PULLS COAL DUST INTO TUBE

## And Sprays It With Water

## Removing Almost All of It From Circulation

IT HAS BEEN estimated that at conveyor loading points of modern mines about ten times as much dust is raised as in any other part of the mine. Attack the dust there and the bulk of the coal-dust problem will be solved. The Coal Dust Research Committee appointed by the Monmouthshire and South Wales Coal Owners' Association, with Dr. T. David Jones, professor of mining, University College, Cardiff, as director of the committee, quotes this estimate as exhibiting the great need for some device to reduce the dust hazard at such points. Tests of the quantity of coal dust present in the air current and of a system of depositing such dusts by baffles and air sprays were made by the committee in a longwall working of the Seven-Feet seam, Bargoed colliery.

At this operation, the conveyor discharges in an intake airway, and sampling stations, at elevations 4 ft. above rail, were selected at various points between the coal face and the discharge end of the conveyor chute. Quantity of dust present per cubic foot of air at the various distances from the end of the chute, as taken by a Soxhlet thimble filter, is shown in Fig. 3. That quantity 10 ft. from the loader was about 0.1 gram per cubic foot of air. At 80 ft. ahead of the loader, it had fallen to about 0.01 gram per cubic foot, a drop of 90 per cent. Ninety feet further, or 170 ft. from the loader, the dust content had dropped only to 0.0045 gram, a little less than half what it was at the 80-ft. mark. Apparently, the coarser material was settling in those first 80 ft. and the finer material in the distance that followed. All the data from which Fig. 3 was plotted were collected while trips of 20 cars, each of a capacity of 2,644 lb., were being filled at the loading point.

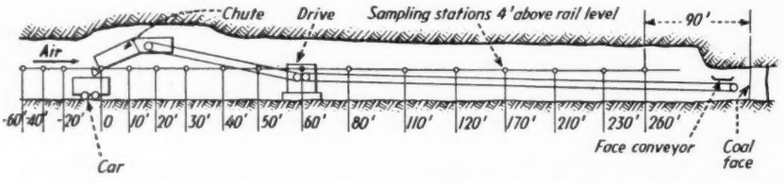



Fig. 1—Position of stations for measuring quantity of dust per cubic foot of air passing inby from mouth of loading chute.

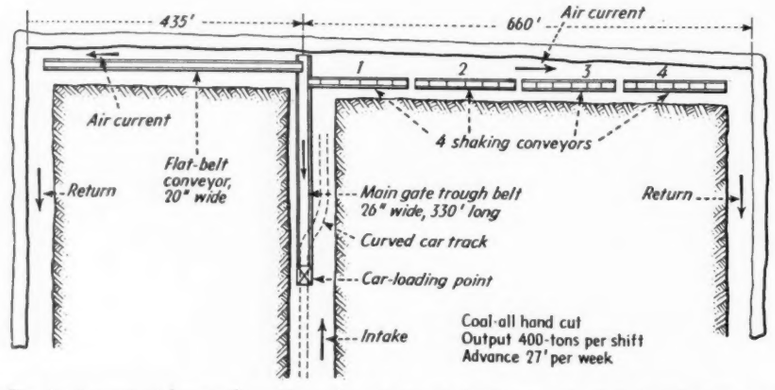



Fig. 2—Layout of longwall working where tests of dustiness and of dust collector were made.

Experiments with dedusting apparatus have finally suggested the dust collector illustrated in Fig. 4, which will be more effective than the first form of collector used at Bargoed colliery. In common with it, however, it will have a suction end, or inlet, in the form of an expanded throat set just below the lip of the loading chute. This inlet takes the place of the larger and more cumbersome hood or cowl placed over the mine car in such other types of collectors as have been applied to conveyor-discharge points.

This inlet has the advantage of being situated behind and below the lip of the chute, where it cannot interfere with car loading. It does not prevent a full load being placed in the car, and the operative can see just what is, and needs to be, done. The throat of the dust collector is much closer to the point where the thickest dust cloud is raised than can be arranged when a hood is provided that must be placed over the car.

As the throat faces the intake, that air current helps the fan to carry the dust into the tube, and as the dust particles do not have to be lifted against gravity—a defect of all hood arrangements—removal of dust is thereby made more complete. To keep

the dust traveling directly toward the collector, old rubber belting is attached to the sides of the inlet.

Two strips of belting are hinged to the roof of the loading chute above the conveyor belt. These act as curtains and prevent the air current from passing up the chute and raising dust from the coal as it leaves the belt. A spillage hopper large enough to embrace the first roller of the return strand of the belt has been provided, as the smaller hopper produced much dust.

Dust-laden air from the throat passes by a 20-in. pipe to the side of the roadway away from the track and then passes through an 18- to 20-in. exhaust fan which draws the dust-laden air at the rate of, at least, 3,000 cu.ft. per minute. The main object is to collect only such dust as would be raised in the air under normal working conditions and not to endeavor to dedust the coal as it passes from chute to car.

The air then goes to a metal box with a 3x3-ft. cross section, 6 ft. long, large enough that, despite three baffles, the cross-section will be so ample that the air speed will be reduced. By baffling the air by two down-baffles and one intermediate up-baffle and by the reduction of speed, the coarse dust will be entirely removed.

This section was 18 ft. long in the original arrangement, and will now be only 6 ft. long. As the discharge equipment has to be moved forward and the dust collector also at the same time, any reduction in length is an important consideration.

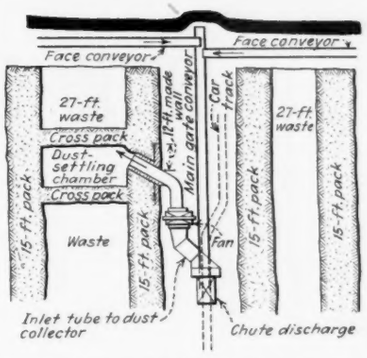



Fig. 5—How dust allayment by dry filtration in pack-walled chamber might be provided in waste workings.

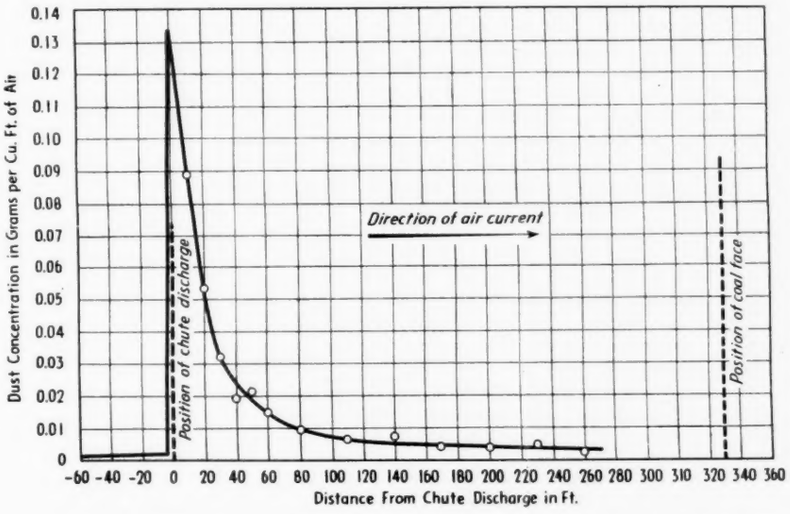



Fig. 3—Dust concentration prior to installation of dust collector.

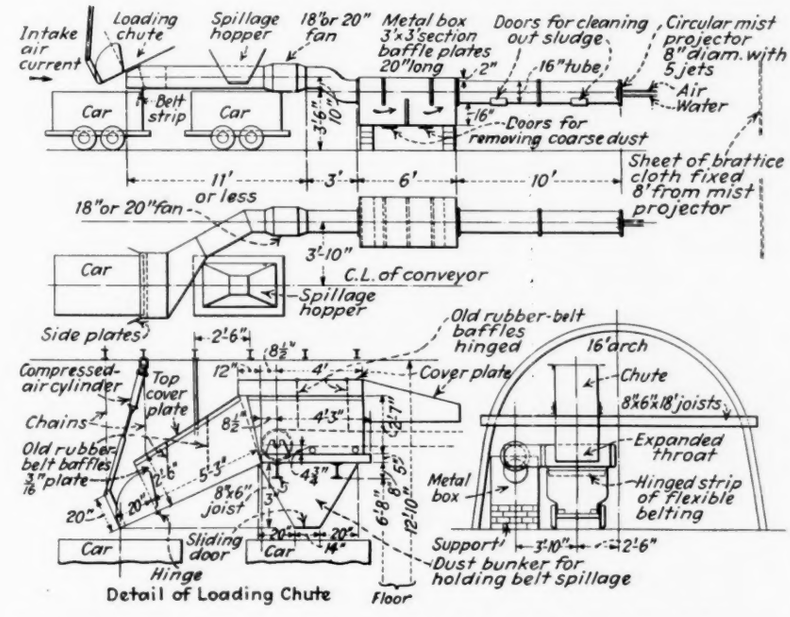



Fig. 4—Dust collector as evolved to date, with detail of loading chute. A 3-in. compressed-air cylinder operates end of chute.

Leaving the metal box, the air enters a 16-in. tube 10 ft. long. In the original equipment, the length of this section was 12 ft. The spray which comes from five injector nozzles operated by compressed air is aimed directly at the dust-laden air as it passes along the final section. What little dust escapes is removed in part from the air by impingement on a brattice cloth hung from the roof 8 ft. from the mist projector.

In certain of the South Wales mines, trouble might be caused by water in the escaping air dropping a little way beyond the dust collector and in such quantity that the floor might heave. In that event, it is proposed that two cross packs be set from main pack to main pack, as in Fig. 5, creating a closed chamber into which the fan of the extractor might discharge through a masonry-lined passage adjacent to the extractor fan. A tight wall, 4 yd. long, also could be built, as shown, along the side of the mother gate inby and outby to prevent leakage into the roadway. In this way it would be possible to eliminate the spray.

The same kind of expanded inlet tube as was devised for the dust collector would serve for gathering the dust for discharge into the closed chamber. If the packwalls should prove too porous in the dry state to filter the dust, conditions might be improved by placing a small jet or mist projector at the end of the tube near the point of entrance to the dust-settling chamber. The small quantity of water blowing into the dust would greatly increase the percentage that would settle.

# NEW LIGHT ON OLD QUESTIONS

## Timely Warning That Will Pay Big Dividends: Sprinkle Air and Mine Near Face

By **WALTER HORNSBY**
*General Foreman, Glogora Coal Co.*
*Glo, Ky.*

This is the season of the year when the greatest number of mine explosions occur, and we all know that most of these, and the most disastrous of them, have been caused by coal dust.

When the air enters your mine at an average winter temperature of, say, 32 deg. F. and leaves it at, say, 65 deg., it gathers moisture from roof, ribs, bottom, and everything it passes. The result is that during every minute, night and day, from the time cool weather sets in until hot weather comes, the ventilation you must have to keep the mine safe and the air breathable creates the greatest hazard known to coal mining.

To open your eyes to the danger involved by this extraction of water from the mine, I proffer the following example: Assume that 100,000 cu.ft. of air is taken into the mine every minute and that the temperature at the intake is 32 deg. F. and the temperature at the outlet is 65 deg., and assuming that the saturation of the air of the mine is nearly complete, the mine will lose 50 tons of water every 24 hours.

### More Air, More Dustiness

This condition exists in all mines and is more dangerous than where gas is present, because we are more afraid of methane than of coal dust and accordingly take more precautions to guard against it. Yet by the use of water this danger under every eventuality can be decreased to a minimum and at a very small cost.

Under all conditions, we must continue to use rock dust and more rock dust, but it is almost an impossibility to use enough of it in a mechanized mine to make an explosion impossible. Nor will water on the cutter bar be enough to assure safety.

With hand-loading, a working place rarely advanced more than about 6 ft. in 24 hours. This gave the coal dust time to settle and the moisture time to accumulate to such an extent that, with the rock dust, the coal dust was rendered harmless; further, as no more than two men worked in each place, about 80 per cent less blasting was done. The temperature of the working place was raised only a degree or two by the mining work done in it, and the air did not carry off so much moisture from it then as it does now. With hand-loading, a high velocity of air at the face was not necessary and a large part of the dust accordingly was loaded into cars and not carried by the air to settle on roof, ribs, and timber—therefore, a mine once rock-dusted would be protected by that dust for some time.

With mechanical loading, a working place advances about 40 ft. in 24 hours. The machinery is continually in motion, making and stirring up dust to be carried along by the high-velocity air that is so essential for good ventilation. This dust settles on everything with which it comes in contact.

A greater volume and higher velocity of air is needed when coal is loaded by machines. On an average, the coal must be blasted at three-hour intervals. Several men are working in each place, and machinery is running at all times.

The air enters the place at normal mine temperature, and then, as it sweeps the face and travels over the warm coal and warm machinery, the temperature is increased several degrees; hence, the air absorbs the moisture at the working face, giving a perfect set-up for an explosion. All that is needed is an arc from a broken cable, an open light or shot fired in a handful of dust, and for recovery and repairs the management may have to spend thousands of times as much as would have installed a sprinkling system; yet in this is not included the loss of lives which cannot be replaced.

### No Reason for Dryness

Few mines are without their pump and water problems, and in most mines water is plentiful near every section of the mine. All that is needed is to install a pressure pump with a small storage tank operated automatically by a starter, to stop the pump when the water is at the desired pressure, and to start it again when the pressure has been lowered to a certain point. A small pipe line is then run to the working places, and a spray should be installed in the entry crosscut which at all times should deliver a fine mist so that the intake air will be fully saturated and will carry moisture into the working place.

Valves should be placed at intervals in the length of the pipe line extending from rock-dusted area to working face, and a hose to which a spray is attached will provide a force of water strong enough to wash down dust from roof, ribs and timber. This should be used once in each shift, for the application of this water would take only a short time. Each cut also should be sprayed before blasting.

Anyone can be instructed to put on this spray, for he can let it run unattended for the few necessary minutes, during which time he can work at something else. The advantage of having a cool, comfortable, dustless, and clean working place will enable the men to work more efficiently and will more than pay for the installation of this system.

A small automatic pressure system such as is used to furnish running water to individual homes can be installed in the main intake airway, and sprays provided that will break the water into a fine mist. These can be kept running at all times and should be placed so far from the surface that the air will have reached the temperature of the mine and the water will be protected from frost. Thus, the air will be saturated before it reaches the working places. If there is no water close enough to put in a pipe line, you can use a tank, hauling water once each shift just as explosives are hauled.

### Value of Moisture Evident

This is no mere pipe dream but is based on what I have noted when engaged in recovery work as to the helpful effects of water in suppressing dust explosions. I have seen where water holes checked the force of an explosion terrific enough to smash stoppings, tear up track, and completely wreck the mine to the water's edge. The explosion, however, continued its ravages left or right wherever no water was present to combat its violence. Where water was plentiful, the only damage was from concussion.

I once saw a trip traveling against the air at a high velocity with an open light on the rear. There were several bug-dust cars in the trip, and the dust that was blown back was ignited by the open light. It happened that the haulway was near the outcrop and water was dripping from the roof, so the heading was wet for some distance. Thanks to this fact, there was merely a flash of fire, and no damage was done. Had this been a dry place, there would have been another big explosion.

In a mine in West Virginia over which I had charge loaded trips traveled against a swift air current. In consequence, for a distance of about one mile the haulageway always was dusty and dangerous. Much money was spent to sprinkle it with an old-fashioned water box. Calcium chloride also was used, but that did not keep the dust down. The State mine inspectors were continually harrying us about the dust.

We then installed an automatic pressure pump and a 2-in. line along this heading with valves 100 ft. apart. Two days each week, one man with a 50-ft. length of garden hose kept this mine cool, clear, and

free of dust. The installation did not cost more than $2,000 and much labor was saved, to say nothing of the safety and security enjoyed after this system was installed.

It may be true that water will cause the top to break or the bottom to heave, but this can be cured by scaling the top more often, by closer inspection, and by using caps or mud sills on the bottom. If the mine has a bad top, you need all the more to guard it against an explosion, for the damage done by exploding coal dust is much more severe than that which would be accomplished by an explosion of black powder because, pound for pound, coal dust is the more powerful explosive.

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# Air Directions Are Too Frequently Reversed Where Auxiliary Fans Are Ill-Placed

In a mine the air when it short-circuits between intake and return has much power. One can hear it howling and some doors can hardly be opened or closed without the expenditure of great effort, but between points on the same airway only 10 ft. apart the difference of pressure may be only such as will show five-hundredths of an inch in the water gage. Hence it is quite easy to have it turned back by the travel of a man, a car, a trip of cars or even an obstacle that causes turbulence. Worst of these current reversers are auxiliary fans, so, like all excellent equipment, they should be used knowingly and with caution.

Atkinson's formula for ventilation is: $p = ksv^2 \div a$, where $p$ = pounds per square inch of pressure, where $k$ is a constant = 0.000,000,0217, where $s$ is the area of the rubbing surface exposed to the air in the distance it has to travel, where $v$ is the velocity in feet per minute and where $a$ is the cross-sectional area of the passageway in square feet. As one inch of water in the gage is equal to a pressure of 5.2 lb. per square foot, the pressure expressed in water gage will be equal to the pressure expressed in pounds per square foot divided by 5.2.

### Resistance of Ten Feet

Therefore, the water gage will equal $p \div 5.2$. Solving this for a distance of only 10 ft. and for a heading 6 ft. high and 8 ft. wide and carrying 14,400 cu.ft. of air per minute, the cross-section $a$ will be 48 sq.ft. and the velocity $v$ of the air will have to be 300 ft. per minute. The rubbing surface will be the periphery of the roadway 6+8+6+8 =28 ft. multiplied by the distance, or 280 sq.ft. Then as $p=ksv^2 \div a$

$$p = \frac{0.000,000,0217 \times 280 \times 300 \times 300}{48}$$

$$= \frac{0.54684}{48} = 0.01139 \text{ lb. per square foot}$$

$$\text{Water gage will be } \frac{0.01139}{5.2} = 0.00219 \text{ in.}$$

Thus in a length of 10 ft., the fall in pressure is equal to only about two thousandths or one-five hundredth of an inch of water gage and, as Atkinson's formula is for an irregular roadway, this figure is frequently quite excessive. But whatever it is, that or less, it is an important consideration, for if a blower fan has a water gage of 2 in. it has a thousand times as much water gage as will carry the air that 10 ft. If the air in the heading were not traveling and a source of air were 10 ft. away, how rapidly would it be drawn to the fan provided it could not get air elsewhere! Of course, the auxiliary fan could not pass 14,400 cu.ft. per minute but it has much more than a thousand times the ability to pull a lesser quantity of air that 10 ft.

Air that may under certain circumstances be available to the fan is that from its own exhaust which after traveling in the pipe to the face returns to the mouth of the working place. If the working place is a room, this mouth is the room neck. If the fan is near the room neck, it may draw some of the air back through its blades and force the air back into the room so that it will recirculate the same old stale air with its methane, carbon dioxide and powder fumes, thus providing an atmosphere that may be explosive or otherwise detrimental to human life.

### Air Swirls in Passage

Of course, the air coursing along the passageway is bowling along at a speed of 300 ft. per minute (3.4 miles per hour) and, if it is traveling straight ahead without obstruction, it will take some force to make the air stop and travel back to the blower fan in the face of this current. But the air is rarely going straight ahead. With high speeds, there is sure to be turbulence. The main stream of air may, therefore, and probably will be, cavorting around and may be diverted in a degree from the fan so that a part of the air from the exhaust may travel back the distance which the calculation assumes. Cars, piled rock and timbers in a roadway also may aid in the diversion of the main air current, and the recirculation will be further aided if the main current is not many times as great in volume as the auxiliary current. The auxiliary fan usually is stationed on the room side of the heading and may be so nearly hidden that it will be reached by the main current only with some difficulty; hence it will be easy for its own exhaust to be drawn back, letting the rest of the air in the main current slide by on the opposite side of the roadway.

For these reasons, blower fans should be put a suitable distance back from the room neck; some say 8 ft., some 25 ft. Too many put the fan right at the mouth of the room and not 10 ft. away. When one observes on the surface the turbulence of air and the freaks in its travel, one cannot understand how persons, with a fan at the very mouth of the room that the fan is ventilating, can take the view regarding the mine workings that "back flow can't happen here. We don't have any recirculation."

## Aid to Foremen

**Foremen will find of helpful interest an article on ventilation to satisfy the peculiar needs of mechanized mines (see p. 44); also references at the Coal Mining Institute of America to the dangers and densities of dust clouds formed by various kinds of mining operations — sumping, cutting across, drilling, loading and transportation—also as to ways of reducing that dustiness, p. 98. In the same report may be found reference to ways of saving steps and so speeding production by what has been described as job simplification and to safety as it applies to blasting. References to lubrication and maintenance, as delivered at the Indiana Coal Mining Institute, on p. 82, also will prove of value to foremen.**

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## Charge Cartridges Together

When a single explosive cartridge is pushed into a shothole, any drill dust that the bottom of the hole may contain is pushed toward the rear of the hole, but the only damage this does is to fill a short length of the end of the hole and so, in a degree, shorten the effective explosive effort at the back of the cut. This is true so long as only one cartridge is used in each hole, but if a second cartridge is pushed in a few seconds later, it will not travel precisely along the same course and therefore will engage some of the undisturbed dust along the side of the path of the first cartridge and will push it ahead as it travels, piling it up eventually between the two cartridges and adding, on firing, to the difficulty with which the detonation of one cartridge will be transferred to the other. Hence, one cartridge may be exploded and the other may fail to explode.

Moreover, in its travel the first cartridge may cause the drill dust to build up to such a height at the sides of the hole that the loose dust will fall down as soon as the first cartridge has passed, and will fall into what will be the path of the second cartridge when that cartridge is pushed into place. For this reason, drillholes should be cleaned out scrupulously if more than one cartridge is to be inserted, and this is so even though the drill dust has some value as a means of filling the crevices in the coal, thus preventing an emission of flame and aiding in the extinction of such flame as the explosion creates when rock is drilled.

### Frilling the Cartridge

Some have arranged, however, to put a sort of frill around the cartridge so as to keep it free from the sides of the hole and provide room for dust as well as air around the cartridge. With such a frill to keep the cartridge off the bottom of the drillhole, the quantity of drill dust would rarely be enough that it would enter the spaces between the cartridges and prevent detonation.

In the anthracite region, where coal dust will not explode and where compressed air usually is available, drillholes can be cleaned by a blast of air. However, lest the cleaning be incomplete, the cartridges in shooting anthracite or bituminous coal should be pushed at one time as if one continuous cartridge with no spaces between. Then dust would have no opportunity to insert itself between cartridges and prevent complete detonation of the charge.

# QUESTIONS ASKED BY STATE BOARDS

## Examination Questions, Steam Hoisting Engineers, Illinois, 1940

### What Is Steam

*Q.*—(a) What is steam and how is it produced? (b) What is meant by high-pressure and low-pressure steam?

*A.*—(a) Most chemical compounds are found in three states—solids, liquids and gases, or vapors—depending on temperature. Water, an oxide of hydrogen, with formula $H_2O$, has a solid state, or phase (ice), a liquid phase (water), and a gaseous, or vaporous, phase (steam). At 212 deg. F., steam at sea level is formed at a pressure equal to that of the atmosphere at that level.

When the air is not saturated, steam will be formed at lower temperatures, but it will not boil at sea level at such temperatures, because the pressure is not sufficient to lift the water above its normal level. When water is heated under partial vacuum, or what is the same, at high elevations, it will boil at temperatures lower than 212 deg. F.

Concisely, steam is produced by heating water, but most people regard only such vapor as has a pressure exceeding that of the immediate atmosphere as "steam." Steam is invisible. That which makes steam appear visible is the presence of fine suspended particles of water condensed from the steam or lifted from the water by the steam escaping from it, but, close to the surface of the water, steam is invisible because there is at that point no condensation and therefore few, if any, particles of water in the steam.

(b) What constitutes low-pressure and high-pressure steam depends on the experience of the person using the expressions. A central-station employee would say anything below 500 lb. per square inch is low pressure, for a plant is going to be built to run at 2,500 lb. pressure and one is being operated that is using 1,800 lb. pressure and steam below 500 lb. per square inch is seldom used today by utility plants. However, a big industrial plant usually will use steam at 450 to 900 lb. pressure and a small one steam at 200 lb. pressure. A heating plant will use 10- to 20-lb. steam. A distinction might be made between saturated steam, that is heated in contact with water, and superheated steam, which is steam that is heated by a superheater after it leaves the boiler, but one manufacturer is making 1,800-lb. saturated steam for use in processing.

### Heat Needed

*Q.*—If the steam in a boiler is at 270 deg. and the feed water is at 110 deg., how many units of heat will it be necessary to add to this water to turn a pound of it into steam?

*A.*—Heat content (entropy) of saturated steam at 270 deg. F. is 1,170.6 B.t.u. per pound. Heat content of saturated liquid at 110 deg. F. is 77.94 B.t.u. per pound. Increase in heat content, 1,092.66 B.t.u. per pound. These figures are taken from steam tables. No one uses a formula for obtaining such data.

### Water Storage

*Q.*—We have a tank full of water in the morning when we commence work. We have no more water in sight; the tank has a diameter of 14 ft. and is 20 ft. deep. How long will we be able to run, using 1,200 hp. per hour?

*A.*—Cross-section of tank is 14x14x0.7854= 153.94 sq.ft. Volume of water in tank 153.94x20=3,078.8 cu.ft. Gallons in tank= 3078.8x7.48052=23,031. 1,000 hp. will require 60 gal. of feed water per minute. 1,200 hp. will require 60x1.2x60 gal. of feed per hour, or 4,320 gal.

Gallons in tank, 23,031, divided by gallons used per hour, 4,320, = 5.331 hr. = 5 hr. 19.9 min.

Another method is to find the number of pounds of water in the tank. Remembering that the weight of a cubic foot of water is 62.5 lb. and having ascertained that the volume of water in the tank is 3078.78 cu.ft., weight of water in tank = 3078.78 × 62.5 = 192,423.8 lb. The American Society of Mechanical Engineers' definition of a boiler horsepower is the power to evaporate 34.5 lb. of water per hour from and at 212 deg. F. but that is equivalent to the power to evaporate $\frac{970.4}{970.4 + (212-60)} \times$ 34.5 lb. = 29.83 lb. of water from 60 to 212 deg. F. and to evaporate that water from and at 212 deg. F., for 970.4 is the latent heat of steam at 212 deg. F. This figure 29.83 could readily be memorized as 30 and will be so used. Multiplying 1,200 by 30, the quantity of water needed per hour will be 36,000 lb. Then the time the tank will continue to supply the needed water will be $\frac{192,424}{36,000}$ = 5.345 hr. = 5 hr. 21 min.

### Heating Surface

*Q.*—In flue boilers, how many square feet of heating surface are allowed per horsepower?

*A.*—Eight to twelve according to one authority; twelve according to another.

*Q.*—How do you determine the horsepower of a tubular boiler?

*A.*—One-tenth to one-twelfth of the heating surface in square feet. The heating surface in the tubular boiler includes the portions below the line of brickwork, the exposed heads of the shell and interior surface of the tubes. Another authority includes two-thirds of the shell and all of the tube surface in a horizontal tubular boiler as heating surface and declares there should be 15 sq.ft. of heating surface per horsepower.

*Q.*—What is the horsepower of a horizontal tubular boiler 5 ft. in diameter and 18 ft. long containing seventy 3-in. tubes?

*A.*—Each of the exposed ends of the shell will have heating surface =

5x5x0.7854 = 19.6350 sq.ft.

Therefore the total heating surface of the exposed ends of the shell will be:

2x19.6350 = 39.2700 sq.ft.

Periphery of the tubes will be 3x3x0.7854 = 7.0686 in.

Periphery of 70 tubes will be 70x7.0686 = 494.8020 in.

Heating surface of tubes = 18x12x494.8020 sq.in. = 10,687.72 sq.in.

Heating surface of tubes in square feet = 10,687.72 ÷ 144 = 742.203 sq.ft.

Total heating surface = 39.27 + 742.203 = 781.473 sq.ft.

The boiler will have a horsepower one-tenth as great, or about 80 hp. There is no authoritative rule; in practice, relation of heating surface to boiler horsepower varies "all over the map."

## First Grade Mine Foremen's Examination Pennsylvania, April 4, 1939

### Drainage

*Q.*—A slope is 14 ft. wide and 7 ft. high and has been driven for a distance of 1,000 ft. The elevation at the top of the slope is 742.3, and at the bottom of the slope 537.4.

(a) If this slope is allowed to fill with water, what will be the pressure of the water, in pounds per square foot at face?

(b) What precautions does the bituminous mine law require to be taken when driving to tap abandoned places known to be filled with water?

*A.*—(a) 742.3 — 537.4 = 204.9 ft. water head; 204.9 × 62.5 = 12,806 lb. per square foot, or 204.9 × 0.434 × 144 = 12,796 lb. per square foot. (2 per cent.)

(b) In any working place that is being driven within supposedly dangerous proximity to any portion of an abandoned mine or any idle portion of an active mine suspected of containing explosive gas or that may contain a dangerous accumulation of water, the mine foreman shall see that at least two boreholes shall be maintained not less than 20 ft. in advance of the face, and on each side of such working place boreholes of the same depth shall be drilled diagonally not more than 8 ft. apart, and any place driven to tap water or gas shall not be more than 10 ft. wide. No water or gas from any portion of an abandoned mine or from any idle portion of an active mine and no borehole from the surface shall be tapped until the employees, except those engaged at such work, are out of the mine, and such work shall be done under the immediate instruction and direction of the mine foreman with the use of approved lamps. (5 per cent.)

### Rock-Dusting

*Q.*—State briefly the legal requirements for rock-dusting in the following: (a) extent of rock-dusting, (b) distribution of rock-dusting, (c) sampling of dust in workings.

*A.*—(a) Rock-dusting shall be done with such regularity and frequency that all surfaces required to be rock-dusted shall be kept in such condition that the incombustible content of adhering and lodging dust shall not be less than 55 per cent. (2 per cent.)

(b) Rock dust shall be distributed on top, bottom and sides of all haulageways, travelingways, airways, developing entries, and entries producing coal from rooms or pillars and their parallel entries. (2 per cent.)

(c) The superintendent shall see that a representative sample of dust is gathered at each sampling point from roof, sides and floor of all entries by a competent person once each two months and tested to determine if any part of mine requires redusting, and a record shall be kept in a book provided for that purpose through the Department of Mines, in the same manner as is provided for the record books of mine officials, showing location at which samples have been taken and results of analyses or tests. The distance between sampling points on haulageways, travelingways and airways shall not exceed 2,000 ft., but, in developing entries and in entries producing coal from rooms or pillars and their parallel entries, distance between sampling points shall not exceed 500 ft. (3 per cent.)

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# Mine Foremen's Examination, Iowa June 11-12, 1940*

*Q.*—Explain the difference in the methods of producing an air current by a force fan and by an exhaust fan.

*A.*—Assuming the fan is at the surface, a force fan will take the air from the outside of the mine and force it into the mine opening by the motion of the blades; an exhaust fan will take the air from the inside of the mine and force it outside in like manner.

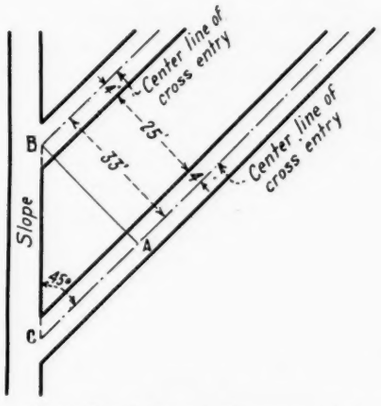
*Q.*—What will be the reading of the water gage in inches if the pressure per square foot is 2 lb.?

*A.*—As the water gage is 1 in. when the pressure of the air is 5.2 lb. per square foot, the inches of water gage will be equal to the pressure divided by 5.2 = 2 ÷ 5.2 = 0.3846 in.

### Pillar Width Calculations

*Q.*—The direction of a slope mine is due north, the cross entries will run N. 45 deg. E. with a pillar of 25 ft. between entries, which are driven 8 ft. wide. Calculate distance between centers on main or slope entry, assuming the point where cross entries are broken off is on the level. Sine and cosine of 45 deg. is 0.70711.

*A.*—Centers of cross entries being 8 ÷ 2 = 4 ft. off the rib, the distance between centers of cross entries will be 4 + 25 + 4 ft. = 33 ft., which on sketch is represented by *AB*. Distance *BC* is distance between cross entries along right rib of slope.




Illustrating intercept of cross entries on slope.

Then $\frac{AB}{BC}$ = sine 45 deg. and $\frac{BC}{AB}$ = $\frac{1}{\text{sine 45 deg.}}$ Therefore *BC* (distance between centers on slope entry) = $\frac{AB}{\text{sine 45 deg.}}$ = $\frac{33}{0.70711}$ = 46.67 ft. = 46 ft. 8 in.

### Explosion Hazard

*Q.*—When the air current in a mine contains marsh gas, which is the more dangerous, air saturated with water or unsaturated?

*A.*—With air unsaturated, the hazard from explosion probably will be the greater (1) because, if day after day, the air is at full saturation, the mine will retain its moisture, and the coal dust is likely to be wet and therefore to cake and then will not rise in the face of an explosion; (2) because (and this Dr. W. J. Huff, consulting chemist, U. S. Bureau of Mines, regards as less important) mixtures containing between 5 and 15 per cent of methane will explode in dry air, where with saturated air mixtures containing between 5.45 and 13.5 per cent are needed, as determined by Coward and Jones (U. S. Bureau of Mines, Bulletin 279, revised 1938, p. 42). The moisture in the air cools the flame of burning methane, just as does a wire gauze, carbon dioxide or nitrogen, and thus reduces in some degree its ability to ignite more gas. On the other hand (1) air, if merely saturated, does not moisten coal dust materially; supersaturation is necessary if the water in the air is to wet the coal adequately, and supersaturation probably rarely occurs except near the mine mouth. Saturation does little more than keep wet dust from drying and adds only slightly to the wetness of dust.

(2) As saturated or almost saturated air in time will moisten coal dust, it creates a moral hazard, for the management will bank on the wetness of the dust, which may be inadequate to prevent an explosion and may be absent in places where the air saturation is less than in other places, or where the air current is less active or where the coal dust has recently been formed and has not had time to gather moisture. Because of the dampened coal dust, the management may fail to apply rock dust, and if rock dust is applied, it may become damp, perhaps even more dampened than the coal dust, and then will refuse to rise when an explosion occurs. What is good for coal dust is bad for rock dust and vice versa, and the relative defects will depend possibly on the qualities of both dusts. For instance, gypsum dust will cake badly.

(3) It is asserted that moisture assists in the combustion of methane and that methane cannot burn without it, but it is recognized that enough moisture to permit combustion probably always is present even in the desert and certainly always in coal mines. Besides, the burning of the methane makes moisture, so if needed, as stated, there will be plenty to supply all the methane with moisture after some of the methane is burned.

On the whole, saturated air probably gives the safer condition if too much reliance is not placed on the saturated coal dust, but there are two sides to the question. Dampened rock dust is likely to permit an explosion, and rock dust probably usually dampens more easily than coal dust. Never bank on the moisture in the air, and unless the coal is wringing wet do not bank on the moisture in the coal.

### Rubbing Surface in Airway

*P.*—Find the number of square feet of rubbing surface in an airway 4 ft. high, 9 ft. wide and 1,000 ft. long.

*A.*—The lengths of the sides of the cross-section will equal 4 + 4 = 8 ft. and the lengths of roof and floor will total 18 ft. So the all-around or perimeter length will be 26 ft. As the length of the airway is 1,000 ft., the rubbing surface will be 26,000 ft.

* Continued from page 60, November, 1940, COAL AGE.

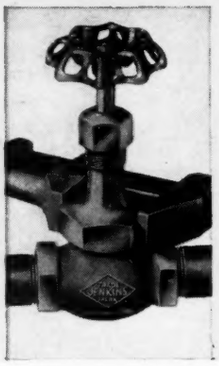
# A MINUTE...OR TWO...AND YOU'RE THROUGH

### DISC HOLDERS READY LOADED

Keep a few extra disc holders on hand already loaded with the Jenkins Discs recommended for your services. Then you are ready to make replacements in the minimum time because disc holders are reloaded in spare time.

### BONNET QUICKLY REMOVED

Apply a wrench to the husky one-piece bonnet and unscrew. By raising the spindle a turn or two you will prevent the disc holder from falling off the spindle.



### SLIP OFF OLD— SLIP ON NEW

Now turn the spindle all the way down and the disc holder will slip off in your hand. Slip on the holder containing the new disc—return the trimming to the body, for "good as new" service.

# QUICK, SURE WAY TO GET DROP-TIGHT SERVICE— *Jenkins* 106-A *Valves*

Speed counts in modern industry. Minutes wasted are dollars lost. Making repairs in minimum time is tremendously important, too.

That's why we ask "when a valve disc must be replaced, do you figure on shutting the line down for a few minutes or for an hour or more?"

With Jenkins 106A Valves, it's as simple as this . . . Just unscrew the body, lift out the trimming and the job's half done. Then slip off the disc holder, slip on a holder containing a new disc and the valve is ready for another long span of trouble-free service.

This is the experience of engineers in thousands of the country's plants, to whom Jenkins Renewable Disc Valves and Discs are standard.

Of course, you require and actually use renewable disc valves—for economy—for versatility—for ease of maintenance. With Jenkins 106A "Family" you get all these advantages *plus* the convenience of interchangeable parts. Check the cut-away views below that explain the variety of valve combinations this unique "Family" make possible. Ask your local distributor about them or write for Bulletin No. 189.

JENKINS BROS., 80 White Street, New York, N. Y.; Bridgeport, Conn.; Atlanta, Ga.; Boston, Mass.; Philadelphia, Pa.; Chicago, Ill.; Houston, Texas. Jenkins Bros., Ltd., Montreal; London.

## *Plus*— VALVE COMBINATIONS through INTERCHANGEABLE PARTS for 90% of your needs

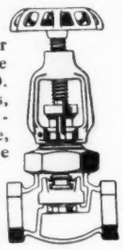
### GLOBE OR ANGLE BODY

Screwed or Flanged

Standard 106-A trimming is exactly the same for Globe or Angle body, screwed or flanged.

### with OUTSIDE SCREW AND YOKE

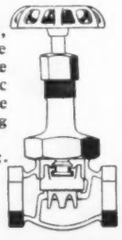
Similarly all four body styles can be fitted with one O. S. & Y. trim. Thus, if service conditions necessitate, the valve can be quickly converted merely by changing the trim.



### for THROTTLING SERVICE

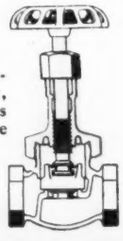
For close control, simply remove the nut which holds the disc in the disc holder and replace with this throttling nut Fig. 344.

For use on Fig. 106-A to 109-A inclusive. Also 106-AY to 109-AY.



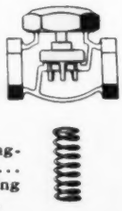
### for QUICK OPENING

For quicker opening and closing, substitute this bonnet and spindle from Fig. 942, in which threads are pitched more sharply.



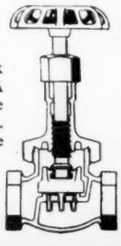
### for LIFT CHECKS

Globe and Angle bodies can be fitted with one trimming—Cap, Disc Holder and Disc Holder Nut from Fig. 117-A. For Spring-loaded services . . . simply add Spring from Fig. 655-A.



### for STOP AND CHECK

For Stop and Check service, use 106-A trim but substitute Spindle from Fig. 630-A and replace disc nut with the check valve disc nut.



### DISCS MADE BY JENKINS

For all these valves, pick the disc *exactly* compounded for the pressure, temperature and fluid to be handled.

# WHAT'S NEW IN OPERATING IDEAS

## Test Hole Which Leaked Gas Grouted From Coal Bed

A bleeder pipe was found necessary in a mine of the Eastern Coal Corporation, Stone, Ky., to drain gas and water back into the mine when grouting an uncharted test hole which had been cut into by development of a butt heading. A search of old records revealed the location on the surface but the casing had rusted away. In attempting to excavate 15 to 18 ft. of sand and gravel to find the hole in the solid rock an air leak was made unknowingly, with the result that the mine exhaust fan (1.5 in. w.g.) pulled air and gas inside. At that stage sealing the hole from the top was abandoned and the job was transferred to the inside.

The grouting connection for the pump was made by forcing a 6-ft. length of 3-in. high-pressure pipe 4 ft. up into the 2½-in. core-drill hole by means of a hydraulic jack. Using 6-ft. lengths of ¼-in. pipe, the bleeder line was extended up into the hole 138 ft. Assembly at the bottom was effected by means of a ¼-in. pipe connection welded through a hole cut in the back of the 3-in. ell, using a flanged union to complete the 3-in. riser connection.

To bleed off the gas and water while concrete was being forced into the hole the ¼-in. pipe was extended 50 ft. from the bottom through a crosscut into the return aircourse. With a 2½x2-in. Fairmont pump the cement and water grout was pumped into the hole until it overflowed through the ¼-in. pipe. After the cement had set, the valve and other fixtures were removed from the bottom. Present-day practice is to plug test holes with concrete as soon as completed, thus avoiding the possibility of difficulties later on.

•

## Safety Shooting Reel Requires Use of Connection Key

From his pocket a shotfirer or miner must produce a special folding electrical key in order to make connection between the dry-cell battery and terminals of a safety shot-firing reel designed and built by O. J. Widener, Dott, W. Va., and which has been used successfully in Wenonah-Modoc mine of the Turkey Gap Coal & Coke Co. The accompanying illustration was made at the Bluefield Industrial Exhibit, where the device won a prize in the miners' gadget contest.

The shotfiring cable is paid out through a guide slot in the wood base of the reel frame. The outer, or free, end of the cable is shunted when reeled up by a copper clip on the base and to this end of the cable is attached an insulating spacer which holds the conductor ends apart when tension comes on the connection to the shooting wires at the face. The other end of the cable terminates in permanent connections to a single-pole shunting switch of the knife type mounted in a notch on the periphery of a flange of the spool.

After the face connections have been made

O. J. Widener demonstrates the electrical key required to make the final connection for firing a shot.

and the cable has been unreeled, the shooting is done by opening the knife switch and connecting the power battery to the terminals or jaws of the switch through the agency of the two copper rods of the electrical key. These rods, with prongs at each end, are mounted between two pieces of fiber and are held in place by rivets through the centers. Thus they may be folded back between the fiber sides like keys in a case.

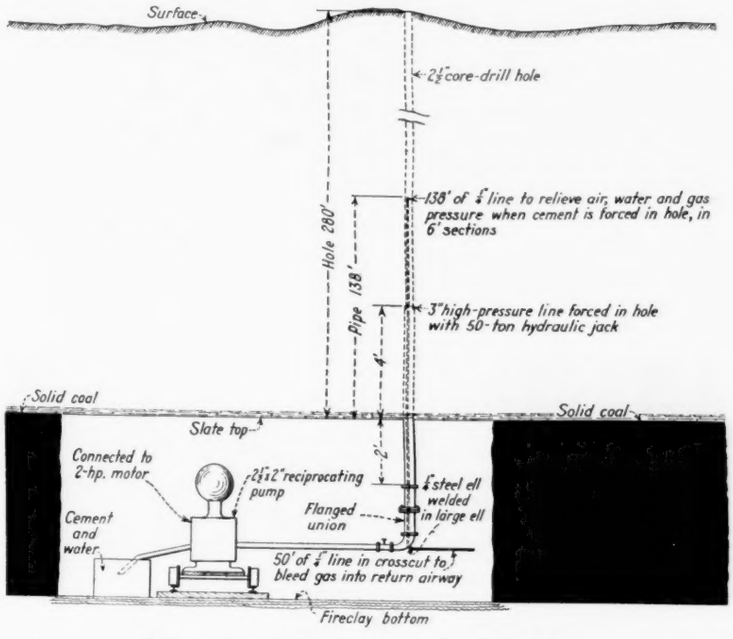
Spool-flange diameter is 9 in. and the over-all height of the reel is 14 in. Cable capacity is 150 ft. and total weight of the reel with No. 16 twin conductor round cable is 16½ lb.

•

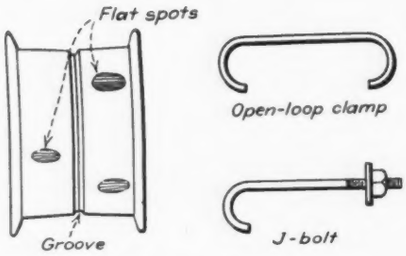
## Rope Wear Can Be Reduced By Proper Rollers

Maximum rope life should be the guiding factor in the selection of rope rollers, contends Charles W. Watkins, Kingston, Pa., in commenting on the advantages and disadvantages of equipment for this service. One method of making rollers at the mine, which has the advantage of cheapness, is to clamp two worn car wheels together as indicated in the accompanying sketch. The clamp may be an open loop put on hot so that shrinkage in cooling will lock the wheels together. As an alternative, a J-bolt may be employed and tightened with a nut.

Such a roller costs little, "but the pressure of the rope soon will wear a groove between the wheels and spring the clamps,


Surface
2½" core-drill hole
138' of ¼" line to relieve air, water and gas pressure when cement is forced in hole, in 6' sections
Hole 280'
Pipe 138'
3" high-pressure line forced in hole with 50-ton hydraulic jack
4'
2'
Solid coal
Slate top
Solid coal
Connected to 2-hp. motor
2½x2" reciprocating pump
¼" steel ell welded in large ell
Flanged union
Cement and water
50' of ¼" line in crosscut to bleed gas into return airway
Fireclay bottom

Fixtures for grouting test hole from the bottom.




Showing conditions which may be encountered when rope rollers are fabricated from old car wheels.

thus causing the wheels to spread. Such a wheel will cut a new rope because single wires will be forced into the groove. At the same time, the wheels are bumping on either side and pinching and wearing the rope in the groove as they work back and forth. Where a number of such rollers are used, the rope will be subjected to much unnecessary wear. If the wheels should have flat spots also, these will tend to keep the rollers from turning, resulting in still further rope wear.

"It is my opinion that the loss in rope wear will be more than the gain by using old wheels. A better plan adopted by many coal companies is to employ new car wheels and weld them together, thus preventing grooving at the joint. Naturally, no flat spots are present with new wheels. Such rollers last a long time and will stand heavy stresses, but I rather believe that they should be used only when the rope pressure always is sufficient to keep them turning when the trip is traveling both up and down. And while they have a very hard running face, such rollers also are very heavy. Therefore, factory-made rollers to suit the rope and work always should be considered in comparison with home-made rollers fabricated from car wheels, as they may be better and cheaper in the long run."

•

## One-Man Operation Facilitated By Proper Dumping Set-Up

"For a small operation where the coal is reached by a slope," writes V. S. Veazey, Pratt, W. Va., "I have used and recommend the plan shown in the accompanying diagrammatic sketch. With this arrangement, the man who operates the hoist on the tipple is the only one needed outside the mine.

"The loads drop in by gravity to the foot of the slope where the rope is attached. The hoist then pulls the load up the slope and onto the dump, where the rope is slacked during the dumping operation. After the car is emptied, the hoist tightens up on the rope, thereby righting the dump and permitting the car to run by gravity back to the foot of the slope and enter the empty track (the switch always being set for the returning empties). With slight changes, this plan may be used at many mines."

•

## Burlap Suited for Brattice Work By Treatment With Chemical

Some months ago, due to the increasing demands of the national-defense program, the Grapevine Coal Co., Madisonville, Ky., experienced considerable difficulty in obtaining heavy duck cloth," reports Carl B. Curtis, Jr., chemist, of Madisonville. "Such cloth has long been an expensive necessity for directing the course of air in the mine. The use of less expensive grades of cloth—i.e., burlap—often has been tried, but, due to its poor lasting qualities, large air losses and extreme fire hazard, it has, for the most part, been unsatisfactory. Its low cost, however, has made it very desirable to work out some method of treatment that would make its use practicable.

"Numerous methods of treating have been tried, but generally rejected because of their cost. Among the best known are creosote and zinc chloride. Some improvement has been achieved in durability but the fire hazard has not been reduced materially. Therefore, it has been the purpose of recent investigations sponsored by the Grapevine Coal Co. to work out a satisfactory low-cost method of treating burlap *which can be used at the mine* to remove in a large measure the fire hazard, at the same time improving durability and reducing air loss.

"The method worked out involves the use of a solution of liquid silicate of soda which may be applied to the cloth either by spraying or dipping—preferably the latter. 'S' Brand silicate of soda (Philadelphia Quartz Co.) was found the most suitable for this purpose. A solution based on the use of five parts by volume of this silicate well mixed with seven parts of water by volume was found to give the most satisfactory product. Twelve gallons of solution made up in this fashion was found sufficient to treat approximately 100 sq.yd. of burlap at a cost, exclusive of the cloth, of less than 5c. per square yard.

"The product resulting from the use of this treatment actually is not fireproof because of the presence of natural hydrocarbons which are given off in the presence of elevated temperatures. A treating medium, therefore, can retard the progress of flame only by shutting off the air from the fibers, thus reducing the possibility of burning. This treatment, however, does not prevent the decomposition of material in the presence of fire. Instead, it makes the cloth fire-resistant in that it will not blaze except at extremely high temperatures but will char and smolder and thus can be easily extinguished. The use of this treatment has reduced by an estimated 40 per cent the air loss encountered with untreated burlap."

## T. & T.

"Time and tide wait for no man" is the way one old saw runs. The moral is particularly applicable to those problems which crop up—sometimes very suddenly—around a coal mine. Getting ready in advance, therefore, should be one objective of all mining men. To help operating, electrical, mechanical and safety men keep prepared is the aim of this department of Coal Age. But your assistance is needed. So send in your idea for cutting cost, increasing efficiency or promoting safety—with a sketch or photo if it will help to make the idea clearer to the reader. For each acceptable idea, Coal Age will pay $5 or more on publication.

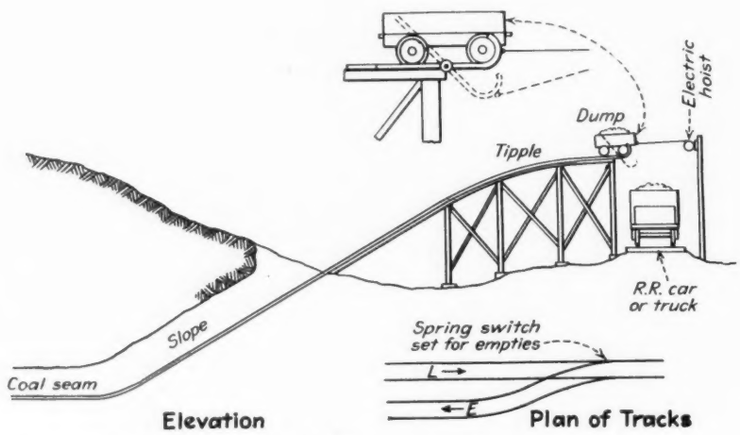
•

## Pile Each Type of Scrap In Its Own Section

Scrap usually is piled promiscuously, so that when time comes for it to be loaded it has to be sorted most painstakingly. This is done by the junk dealer often at his yard in unloading. But where a company sells its stock direct to the industrial consumer, and thus cuts out the middleman, it has to do its own sorting and does better to do so as the scrap accumulates. It then knows all the time how much scrap of any classification it has in stock and can tell how much of any kind of scrap it can furnish and whether there is enough to fill a car.

There are 75 classifications of iron and steel scrap alone as specified by the National Association of Waste Material Dealers, but no coal company would attempt such a complete classification. Prices vary greatly and different classes of users need different kinds of scrap.

At the far end of the timber yard at the Olyphant colliery, the Hudson Coal Co. has erected a stone wall along the siding with a raised yard back of it for the storage of scrap, each separate classification forming a segregated pile; such are cast iron, malleable iron, overcharging scrap, undercharg-




Details of one-man hoisting and dumping arrangement.

# HAZARD MINING CABLES

**Designed exclusively for mining work by engineers who spend much of their time underground studying operating conditions, Hazard mining cables are the result of first-hand practical experience. For more than 40 years they have served the industry well.**

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**HAZARD INSULATED WIRE WORKS**
**DIVISION OF THE OKONITE CO.**
**WILKES-BARRE, PENNSYLVANIA**

**OFFICES IN PRINCIPAL CITIES**

ing scrap and scrap that is so bulky that it is sometimes broken up, as thereby a better price is realized.

Alloy steel and other types of scrap are separately piled. On the back of the yard are stored such pieces of discarded equipment as may possibly be utilized later "as is" if a place can be found for them. Other material awaits a trip to the machine for straightening and perhaps threading or for welding purposes.

The scrap along the track is loaded by the same crane that handles the timber, a 12½-ton capacity DC Industrial Brownhoist gasoline-propelled crawler crane with a 50-ft. boom, but in this scrap-handling service, the timber grab is replaced by an Electric Controller & Manufacturing Co. lifting magnet No. 3-SA of 36 in. diameter and operated by 300-volt d.c. current. For its power supply, a line with the necessary plug has been buried along the wharf.

•

## One-Man Dumping Installation Handles Little Betty Refuse

Terming it a simple installation which permits one man, also driving the truck, to dump and dispose of gob and slate, Carl Donie, mine manager, Little Betty Mine No. 3, Linton, Ind., forwards a description and sketch of the dumping arrangement in question. The dump itself is made from an old Phillips crossover unit, revised, however, so that the car runs back to the empty track instead of on across, as it normally would. Loaded cars are set on a track with a 3-percent drop toward the dump. By turning a load loose it runs onto the dump, which is level, and stops against the horns.

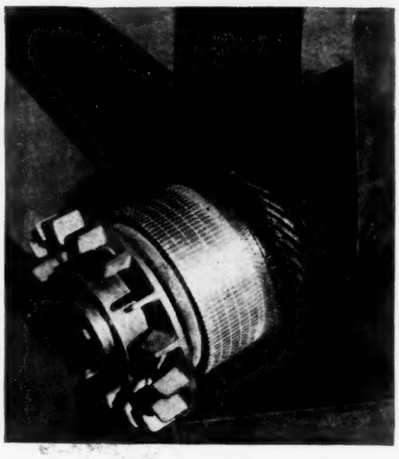
The dump tongue and brake shoes are used, the latter always being set on the brake tongue by the action of a weight. The brake also is very useful in holding the car in any desired position in the dump. Operation is based on the fact that a loaded car weighs about 2½ tons more than an empty one. The center of the car sets forward of the center of the rockers so that the load dumps itself. The dump then is righted by the weight of the dump and brake tongues. In this operation, the cars come back out of the dump fast when the brake is released and take the switch into the empty track with little or no help from the operator.

"This dump," Mr. Donie states, "has been very successful. As it requires no motive power of any sort it also is very economical. One man operates it and hauls away gob at the rate of two cars every five minutes. The round-trip distance is one-half mile. Both tongues must be pretty heavy to counterbalance the weight of the car. The dump tongue is made of two angles about ⅞ in. thick and the brake tongue, 8 ft. long, is made of 1x4-in. bar steel."

•

## Spiral Commutator Grooves Improved Maintenance

Applying the screw conveyor principle to the turning of commutators on 35-hp. mining machines used by the Eastern Coal Corporation, Stone, Ky., has, in the opinion of some of the maintenance men, retarded development of flat spots from brush sparking. Roasted coils and commutator difficulties were characteristic of these machines under the severe service conditions encountered.



Commutator surfaced with a spiral groove.

Glass-insulated coils have been adopted for rewinds and that improvement, together with the commutator "screw," is credited with a reduction in delays and maintenance.

The commutator surface is finished with a spiral groove $\frac{1}{16}$ in. wide and $\frac{1}{32}$ in. deep. Pitch of the groove is two threads per inch. Under the duty imposed on this type of coal-cutting machine, brush-contact area is considered to be overloaded and it is the supposition that the groove tends to convey sidewise from under the brush any dirt which might cause further overloading in local areas and a resultant increase in sparking. Before use of the spiral grooves the commutators often developed flat spots on opposite sides approximately 2 in. long.

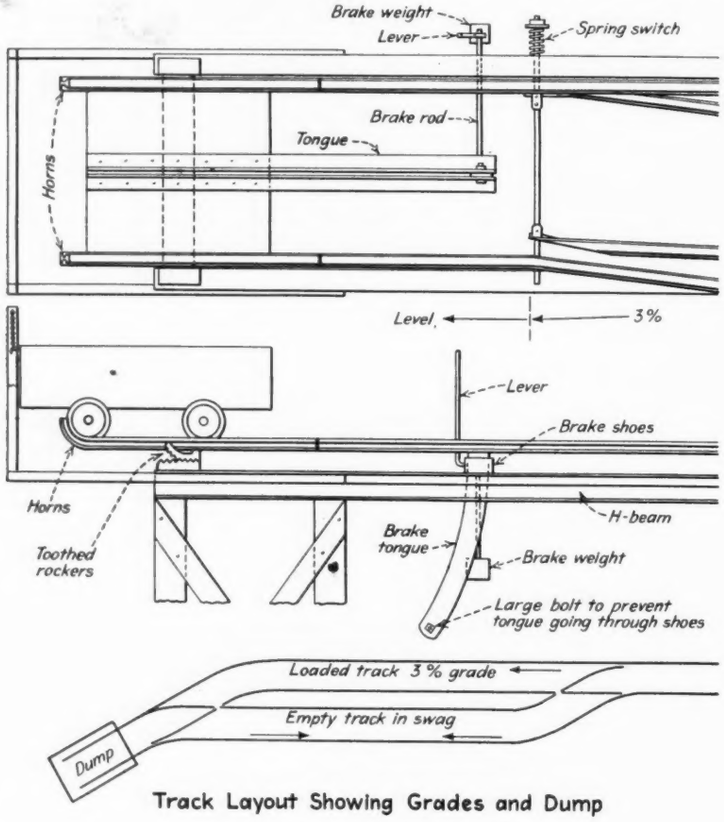
o

## Old License Plates Utilized In Numbering Equipment

"With the increased necessity for more accurate control of operations, nearly every mining company has felt a need for various types of numbers or number plates on equipment and fixtures," writes K. N. Banthin, mining engineer, Oak Park, Ill. "An excellent opportunity for securing the necessary metal numbers occurs at the end of each year when automobile plates expire." A request to mine employees generally will bring in a good supply of used plates, especially if word is passed that new bolts for those who want to change before or after work are available at the blacksmith shop.

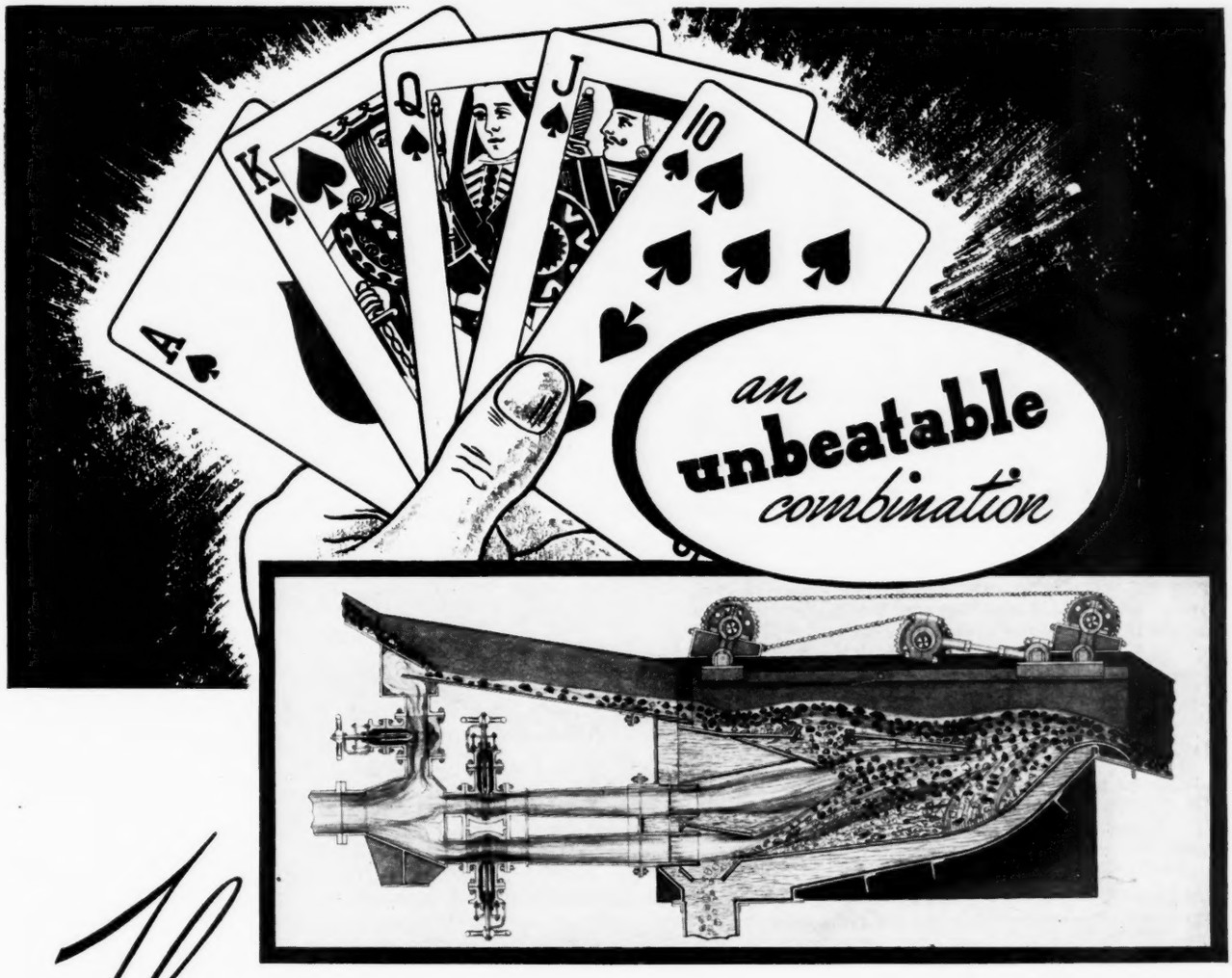
"Two years ago, in the establishment of a new system of haulage control and the reconstruction of a number of wooden-sided mine cars, a part were fitted with numbers made from old license plates while the remainder had the numbers stencilled on with paint in the conventional way. Last year, with the rebuilding of another batch of cars, all were equipped with old license-plate numbers. The sheet-metal license plates may be readily cut up with tin shears and the resultant individual numbers assembled in the desired groups.

"The license-plate numbers have the following advantages over stencilled numbers: do not fade out with age, no paint cans to clean up, no stencils to clean, no paint brushes to clean; readily attached with two to four nails, screws or bolts; no stencils to attach prior to painting; no stencils to purchase and replace when lost; numbers




**Track Layout Showing Grades and Dump**

Details of Little Betty gob and slate dump.




# The MORROW-PRINS *Multi-Flow* COAL WASHER

You hold the five high cards when you own a Morrow-Prins Coal Washer, because then you can consistently supply today's *high profit* coal market with the clean, *prepared* coal it demands . . . and profit from low production costs.

• • •

Why not let a Morrow Engineer discuss the advantages of a Morrow-Prins Multi-Flow Coal Washer in your tipple? It's the sound, inexpensive way to win prepared coal profits.

**Just Check This "Royal" Combination of Morrow-Prins Advantages**

**Versatile**—Efficiently handles both small and large tonnage . . . any variation in size.

**Efficient**—Completely cleans and accurately separates 75 tons of coal hourly per foot of width.

**Low Cost**—Operates on one-third to one-fourth horsepower per ton of coal cleaned per hour.

**Simplicity**—*Easy to operate*—functions in accordance with natural physical laws.

**Adaptable**—Requires no extensive alteration to your present set-up—installation seldom interferes with present production.

**MORROW**

MANUFACTURING CO. WELLSTON, OHIO

DESIGNERS AND BUILDERS OF COAL HANDLING EQUIPMENT FOR OVER 25 YEARS

ADVERTISING PAGES REMOVED

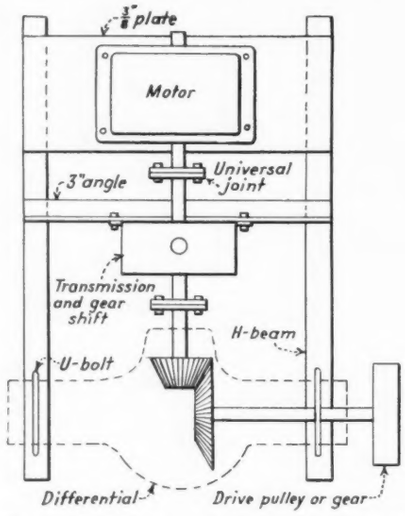
are large enough to be read easily at some distance; dusty numbers are easy to wipe off and then show up as good as when originally installed; numbers may be installed by any shop man without the previous experience usually necessary with stencilling, and the car can be returned to service immediately without waiting for paint to dry.

"These old license plates are covered with a paint that stands up under outside conditions. Thus, they lend themselves very well to marking chutes, spotting points for cars, parking-lot spaces, timber-storage yard lengths and locations, etc."

•

## Conveyor Drives Fabricated From Truck Transmissions

Conveyors have been driven through the medium of truck transmissions and differentials for some years at the mine of the J. H. Somers Coal Co., Adena, Ohio, writes John Gross, electrician. Such units have been installed instead of the usual countershaft or speed reducer on both chain and belt conveyors. The makings come from used trucks, and the transmission units are assembled in



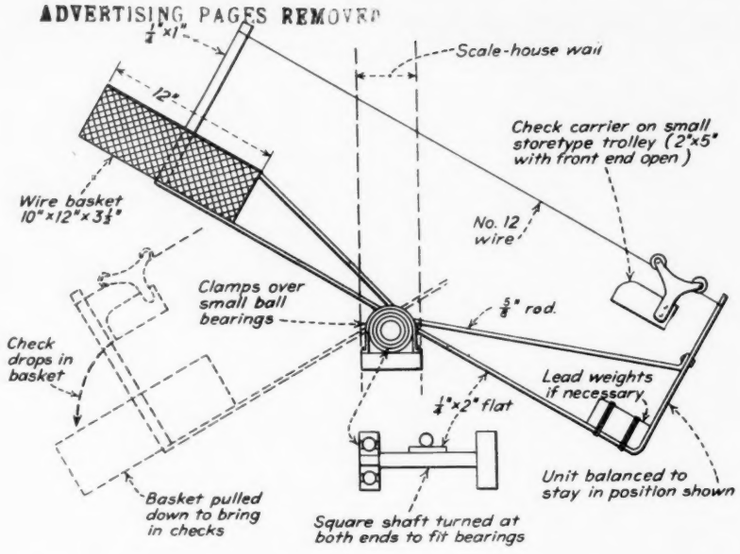

Showing how drive unit made of old truck transmission and differential is assembled.

the shop as shown in the accompanying diagrammatic sketch. Once made up, they may be moved and installed as an integral unit. They need no attention beyond filling them with oil about every three months.

•

## Tilting Carrier Facilitates Transferring Checks

Using a trolley from a small store-type cash carrier, a wire basket and a tilting frame mounted on ball bearings, Charles Bolcheck, master mechanic, Royal mine, W. J. Rainey, Inc., Chestnut Ridge, Pa., has made the check transfer sketched in the accompanying illustration. The ball-bearing mount is installed in the scale-house wall and the unit is weighted so that it normally is tilted to the outside. Miners' checks removed by the car dropper are dropped into the small trolley-mounted basket. To bring the checks inside the scale house, the weighmaster pulls down on the


¼"x1"
12"
Scale-house wall
Check carrier on small storetype trolley (2"x5" with front end open)
Wire basket 10"x12"x3½"
No. 12 wire
Clamps over small ball bearings
⅝" rod
Check drops in basket
Lead weights if necessary
¼"x2" flat
Unit balanced to stay in position shown
Basket pulled down to bring in checks
Square shaft turned at both ends to fit bearings

Details of tilting-type check transfer.

basket, tilting the unit and causing the check carrier to run down the wire into the house, where the check falls into the wire basket by gravity. When the basket is released, the unit tilts back and the carrier runs outside, ready to receive another check. The unit, says Mr. Bolcheck, may be made in any desired length.

•

## Identification Tags for Valves Facilitate Correct Usage

Changing plant forces occasionally result in confusion and errors in valve operation. Consequently, V. S. Veazey, W. Va., suggests that tags be placed on all valves stating what they are used for, how they should be operated, size and other necessary details. An example might be: "Water to Boiler No. 6. Open slowly to about two full turns."

•

## Discarded Pump Valves Utilized As Electrical Insulators

Discarding worn-out rubber pump valves had been the custom at the Cadogan mine of the Allegheny River Mining Co., Cadogan, Pa., until "a few months ago, when we suddenly needed insulators to place in motor frames and other metal structures through which electric wires must pass," states James Thompson, superintendent. "Ordinarily," Mr. Thompson continues, "such holes are bushed with porcelain insulators to prevent wear and short-circuiting of wires or cables.

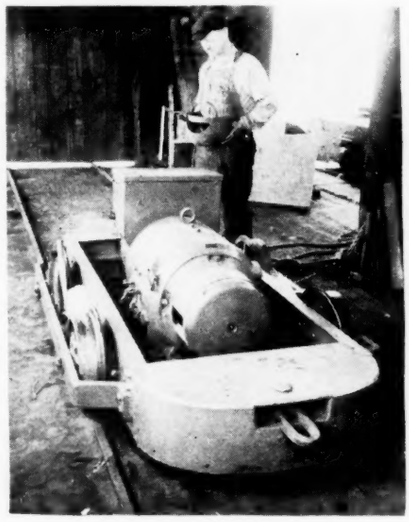
"Since we did not have in stock at the time the regular insulators for such jobs, C. E. Morris, our chief electrician, struck on the idea of taking some of our discarded rubber pump valves, boring them with holes corresponding in number to the wires to pass through them and bolting them to the motor frame or other structure. They make very efficient insulators and are not as easily broken as the porcelain type. Needless to say, we have a number of such insulators in service where electric wires enter metal frames and they are proving highly satisfactory."

## Low Mounting for Arc-Welder Made with Stub Axles

Although on a mine truck with 16-in.-diameter wheels, a new portable arc-welder mounted recently in the shop of the Wise Coal & Coke Co., Dorchester, Va., stands but 33½ in. above the rail. The latter dimension is over the controller, which came mounted on the welder unit. Height over the generator is 26 in. This arc-welder, a recent purchase, is a 300-amp. Flexarc machine.

Track gage is 44 in. and the wheelbase of the truck is 36 in. Side channels are 12x2¾ in. and the inside dimensions of the box, or body, which accommodates the unit are 37x68 in. Ends to which the bumpers are attached consist of 5x5 in. I-beams, one on top of the other. Bumpers were fashioned from ¼-in. plate, arc-welded.

Wheels have plain bearings on stub axles. The outer axle supports were made from 1¼x4-in. stock and are riveted to the channel sides. Between the wheels and in the space flanked by the axle support and channel, boxes were built to carry electrodes. In the illustration, E. L. Salyer, shop foreman, "stands back of the job."



New welder on its truck in the Wise shop.

# WHAT'S NEW IN THE FIELD

## With Federal Price Control "Working Smoothly" Ickes Will Ask Extension of Coal Act

FINDING Senator Guffey, father of the Guffey-Vinson coal act, well pleased with two months of government bituminous coal price control, Secretary of the Interior Ickes has indicated that he will recommend extension of the act for two years more when it expires on April 26. Howard A. Gray, director, Bituminous Coal Division, found occasion to declare that the act is functioning smoothly in a letter taking issue with a charge by Jesse V. Sullivan, secretary, West Virginia Coal Association, that the act was helping Pennsylvania operators at the expense of those in West Virginia, Ohio, Kentucky and Illinois. Even a large producer is quoted as conceding that the act has given the industry the foundation that was needed, elimination of price cutters proving a real tonic for business.

Distress coal has almost disappeared from the market under federal regulation, according to an announcement on Dec. 18 by Secretary Ickes. During November, he said, only 225,591 tons was sold in commercial markets at distress prices out of a total production for the month of 40,300,000 tons. The Secretary said this had been accomplished by permitting owners of large quantities of coal in grades and sizes not immediately in demand to substitute these coals, usually more expensive, in filling orders for less plentiful lower grades.

An order was issued by Director Gray on Dec. 9 amending marketing rules and regulations to prevent middlemen from avoiding terms of the coal act by shifting in name from designation as distributors to that of sales agents without bona fide assumption of customary sales agency functions. Under the order, producers may not pay sales agents commissions under contracts negotiated after Aug. 8, 1940, greater than the maximum discounts allowable to distributors without specific approval of the Coal Division. The order also applies where contracts made prior to that date are changed after Aug. 8, 1940, the date when minimum prices were promulgated by the Director. The provisions of the order will apply to coal sold or delivered after Jan. 1, 1941.

Whereas, under the Division's rules, persons designated as distributors purchase their coal outright from the producers and then resell it in wholesale quantities, sales agents do not buy from producers but merely sell coal in behalf of the producers. The maximum discounts which producers may make from the minimum prices when selling coal to distributors for resale is fixed by the Division, but there has been no regulation fixing specific maximum commissions which producers may pay or allow to sales agents.

A Division trial examiner has recommended that producers who are members of the code, their sales agents, registered coal distributors, registered farmers' cooperatives and persons controlled by or affiliated with any of them be required to maintain for inspection or file with the Division information showing the detals of each coal transaction. Such information includes copies of invoices, credit, debit and other memoranda pertaining to coal sales distribution, records of movements of coal from docks and other places of storage, etc. The Division consulted with representatives of numerous producers' boards and individual producers before compiling the proposed orders, which were submitted to public hearing.

### Court Denies Stay on Prices

The U. S. Circuit Court of Appeals at Cincinnati on Dec. 4 denied the only motion for a stay filed against the minimum prices and marketing rules. The motion was filed by the Powhatan Mining Co. and the Ohio & Pennsylvania Coal Co., both of Cleveland, in connection with suits filed against Secretary Ickes and Director Gray asking for a review of the Divison's order establishing minimum prices for certain coals produced by the companies and for a review of Director Gray's order refusing to modify those prices. The court's order also set the final hearing on the merits of the suits for Feb. 3 and permitted intervention by the producers' boards for Districts, 1, 2, 3, 4 and 8, representing producers in Pennsylvania, Maryland, Ohio and certain fields in West Virginia, Kentucky, Tennessee and Virginia.

Two other court suits against the minimum prices are still pending, but motions for stays have not been filed in either. Only one of the actions—that by the Ayrshire Patoka Collieries Corporation and eight other Indiana producers, in the U. S. Circuit Court of Appeals at Chicago—attacked any of the fundamental features of the minimum prices. The other case—filed by the Wheeling Township Coal Co. in the Circuit Court of Appeals at Cleveland—was limited to specific prices for a specific mine.

Director Gray's letter replying to the charges of Mr. Sullivan follows:

"Your assertion that the minimum prices have caused Pennsylvania producers to gain business at the expense of producers in West Virginia, Ohio, Kentucky and Illinois is utterly without foundation. An unbiased study of production statistics in the light of well-known circumstances in the coal industry shows that conclusively. Contrary to the inference of your statement, the Coal Act is functioning smoothly and it is giving the coal industry the first real protection it has ever had. National coal production has returned to normal seasonal levels, and the industry is rapidly settling down to rebuild itself into a financially sound and stable unit of the national economy, now that the burdens of demoralized marketing conditions have been removed.

"I might point out that while the 60-day period in which the law permits persons to ask the U. S. District Courts of Appeals to review the Division's determinations has passed, only three court cases were filed out of the more than 13,000 producers and the hundreds of thousands of consumers affected by the minimum prices. Only one of these cases attacked any fundamental features of the minimum price structure, while the other two were limited to specific prices for specific mines. None of them attacked the fairness of the Division's procedure.

"The stocking of coal by consumers in anticipation of a price rise had the effect of temporarily interrupting steady production for a few weeks after the minimum prices became effective, but production now has settled down to a normal rate. Production increased at more than the usual rate prior to Oct. 1, 1940, while the consumers were pouring coal into stockpiles, and then it slacked off for a few weeks afterward while consumers used up the excess stores they had accumulated.

"Because of circumstances peculiar to the coal industry, this temporary interruption was a little more pronounced in West Virginia and other States than in Pennsylvania. A greatly larger portion of the coal production is owned or controlled by consumers in Pennsylvania than in other States, and there was no reason for such consumers to store coal in anticipation of a price rise. Therefore, production did not increase as greatly in Pennsylvania prior to Oct. 1 as it did in other States, nor did it decrease as much after the prices became effective. This great block of consumers who produce their own coal in Pennsylvania kept right on taking coal direct from the mines throughout the period.

"In case you are not familiar with the statistics on stockpiles—even though you compared the 1940 production with the 1939—you might be interested to know that as of Oct. 1, 1940, industries had 42,177,000 tons of coal in storage, as compared to 30,243,000 tons a year ago. Retail coal yards had 9,000,000 tons on hand, as compared with 6,700,000 tons a year ago.

"Production statistics for the week ending Nov. 16, 1940, show the country's total production of coal to be 10,000,000 tons for the week. This is approximately the same tonnage as was produced during the comparable week of a year ago. This indicates that coal marketing again is following normal characteristics. It is interesting that during this particular week, production in Pennsylvania decreased slightly, although still maintaining

a high level, while production in West Virginia increased substantially. Other States also showed increases.

"There are two other factors to be considered in comparing the production in Pennsylvania with other States: the influence of industrial buying and seasonal fluctuations.

"The proportion of the tonnage used for the manufacture of steel and other industrial purposes is greater in Pennsylvania than it is in the other States. Pennsylvania's production is subject to greater fluctuations over the years than any other major coal-producing State because of fluctuations in demands for industrial coal. Therefore, increased demands for industrial coal—particularly in the steel industry—also contributed to holding up Pennsylvania's tonnage since Oct. 1. Our records show that while ordinary commercial production dropped after Oct. 1 because of the stocking, the production of Pennsylvania's consumer-owned or affiliated mines actually increased.

"A greater proportion of the tonnage produced in West Virginia and the other States is used for domestic heating than of that produced in Pennsylvania. Therefore, the warm fall weather also helped to reduce the demand for coal produced in West Virginia and other States, in addition to dealers' stocking. This seasonal influence was less marked in Pennsylvania, since a smaller proportion of her coals are used for domestic purposes.

"The Coal Act provides machinery for making immediate adjustments in the minimum prices when and if they cause shifts from one producer or area to another. Producers or producers' boards can file petitions asking for adjustments in the minimum prices and get very quick temporary relief while final action is pending in such cases.

### No Petitions for Relief

"If, as you said, the minimum prices were causing business to be diverted from West Virginia and the other States to Pennsylvania, the Division would have been swamped by petitions seeking relief long before now. I can say without reservation that we have had no such storm of petitions. Even the petitions filed by individual producers in isolated cases seeking price changes because of alleged diversion of business to producers in other districts are moderate in number and in scope, and they are quickly disposed of.

"I might point out that the statement issued by W. A. Richards, Bluefield, W. Va., president of the Sovereign-Pocahontas Coal Co. and a member of the producers' board for District 7, which is one of West Virginia's greatest coal fields, branding your charge 'as ridiculous as it is untrue,' said:

"'The district boards representing these producing districts are naturally checking the resulting distribution of bituminous coal under government price fixing very closely. To date there have been little or no shifts in tonnage from one district to another. Mr. Sullivan can rest assured that if any shifts of tonnage actually do occur, District Boards Nos. 3, 7 and 8, representing West Virginia, are perfectly capable of bringing about a correction, and that in the meantime he should leave comments on production ratios to men who have at least studied that subject and can analyze them fairly.'"

# Coal Code and Central Pennsylvania Analyzed At 15th Bituminous District Meeting

THE Guffey Coal Act and its effect on central Pennsylvania featured the 28th mining institute of the 15th Bituminous District of Pennsylvania, at Barnesboro, Nov. 23. Additional timely subjects included mine rescue, accident prevention, underground electrical equipment and subsidence.

"I don't know and I don't think anybody else does," stated Heath S. Clark, president, Rochester & Pittsburgh Coal Co., what the Guffey Coal Act will do to central Pennsylvania. He viewed the act as an experiment where futures were dependent upon unpredictable events. However, he continued, it is interesting to speculate on the effects of the law.

In reviewing its history and mechanics, he pointed out that it is primarily a price-fixing act which attempts to establish minimum prices based on average production costs. Taking into consideration the various kinds, quantities and sizes of coals, it classifies them according to relative market values, uses and other factors. The task is enormous, he continued, as bituminous coal is produced in 31 States, is used for dozens of different purposes and is "carried by rail under schedules of rates that are a hodge podge of differentials, based upon no logic of economics, geography or anything else."

The best indication of the tremendous task involved was the time required to produce a final price list which took the Coal Commission and the Coal Division four years and one month to compile. There have been hundreds of thousands of separate and distinct prices fixed for the 23 producing districts. As to whether the act will work, Mr. Clark remarked, "it will when there is a strong demand for coal; that is, when the industry doesn't need it. Under the program for national defense any minimum-price schedule will function and prices may well exceed the statutory minimum by operation of the old law of supply and demand, a law which it may be doubted was repealed by Senator Guffey."

### Production Cost Affects Price

Of particular impact upon central Pennsylvania, he continued, is the method of basing prices upon the cost of production. This is not each producer's or district's cost but is the average of a minimum price area. "The act provides three different geographical set-ups: producing districts, marketing areas and minimum price areas. Central Pennsylvania is in District No. 1, constituting, with Districts 2 to 8, inclusive, Minimum Price Area No. 1. The Coal Division has reached the following costs by data covering the last nine months of 1937. Average cost of production of Area No. 1—Pennsylvania, West Virginia, Maryland, Ohio and Michigan—is $2.13 per ton. The average cost of District No. 1, which includes central Pennsylvania, is $2.39 per ton. The average for District No. 1, by the present price schedules, is $2.17, or approximately 22c. below average production cost. "Obviously there is no gravy for this field . . . but neither was there for most of the years before the Guffey prices."

The 15th Bituminous District, he pointed out, produces chiefly low-volatile coal and principal outside competition is from the low-volatile field of the South, known as District No. 7. Labor cost in District No. 1 is $1.55, compared to $1.38 per ton in District No. 7, or a 17c. edge for District 7. Total operating cost—that is, labor, power and supplies—shows an edge of 22c. per ton in favor of District No. 7. However, selling expenses of District No. 1 are lower, making over-all cost 17c. above that of District No. 7. Costs probably are lower today in District No. 1 and in the South. Possibly costs are relatively still lower in the South because mechanical loading has made greater headway there, said Mr. Clark.

## Keeping Step With Coal Demand

### Bituminous Coal Stocks

| | Thousands Net Tons Nov. 1 1940 | P.C. Change From Oct. 1 1940 | P.C. Change From Nov. 1 1939 |
|---|---|---|---|
| Electric power utilities | 11,309 | −0.25 | +35.11 |
| Byproduct coke ovens | 9,712 | +9.60 | +33.96 |
| Steel and rolling mills | 655 | −5.07 | +2.34 |
| Railroads (Class 1) | 5,478 | −3.54 | +8.47 |
| Other industrials* | 15,290 | −1.70 | +17.98 |
| Total | 42,444 | +0.76 | +23.85 |

### Bituminous Coal Consumption

| | Thousands Net Tons Oct. 1940 | P.C. Change From Sept. 1940 | P.C. Change From Oct. 1939 |
|---|---|---|---|
| Electric power utilities | 4,812 | +15.20 | +6.91 |
| Byproduct coke ovens | 6,928 | + 4.59 | + 8.25 |
| Steel and rolling mills | 868 | +15.42 | −11.43 |
| Railroads (Class 1) | 7,350 | +11.27 | − 1.34 |
| Other industrials* | 10,373 | +20.28 | + 1.81 |
| Total | 30,331 | +13.24 | +18.85 |

* Includes beehive ovens, coal-gas retorts and cement mills.

### Coal Production

BITUMINOUS

| | |
|---|---|
| Month of November, 1940, net tons | 40,300,000 |
| Per cent decrease from Nov., 1939 | 6.93 |
| January-November, 1940, tons | 411,927,000 |
| Per cent increase over Jan.-Nov., 1939 | 15.31 |

ANTHRACITE

| | |
|---|---|
| Month of November, 1940, net tons | 3,869,000 |
| Per cent decrease from Nov., 1939 | 3.01 |
| January-November, 1940, tons | 45,353,000 |
| Per cent decrease from Jan.-Nov., 1939 | 4.95 |

### Sales of Domestic Coal Stokers Vs. Oil Burners

| Sales | Coal Stokers | Oil Burners |
|---|---|---|
| October, 1940 | 25,096 | 31,378 |
| Per cent increase over Oct., 1939 | 39.11 | 11.59 |
| January-October, 1940 | 132,234 | 168,889 |
| Per cent increase over Jan.-Oct., 1939 | 49.97 | 18.92 |

### Index of Business Activity*

| | |
|---|---|
| Latest week | 141.0 |
| Per cent gain over month ago | 0.64 |
| Per cent gain over year ago | 14.44 |

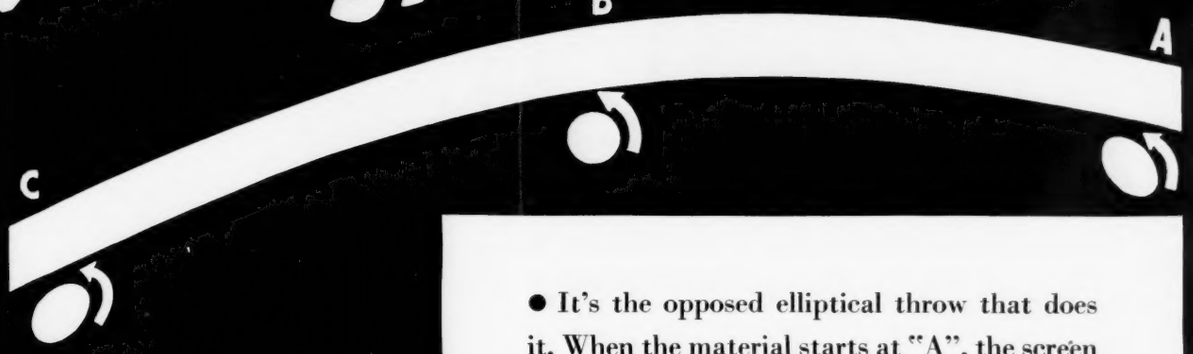
* *Business Week*, Dec. 14.

### Electrical Power Output †

| | |
|---|---|
| Week ended Dec. 7, kw.-hr. | 2,838,270,000 |
| Per cent increase over month ago | 4.36 |
| Per cent increase over year ago | 9.80 |

† Edison Electric Institute.

# WHY PLAT-O SCREENS SIZE BETTER!




● It's the opposed elliptical throw that does it. When the material starts at "A", the screen is nearly flat, and it is pushed along by the throw alone. As it progresses over the screen (with the smallest fines taken out here), the throw becomes circular, turning the material over and over.

The last third of the screen is definitely downhill—here the very large oversize shoots off, while the near-size is thrown back, turned, twisted, until the accuracy known only to PLAT-O screens is obtained. Write for new bulletin No. 27.

**Demand these 8 Features:**

1 Opposed Elliptical Throw—Low Headroom—Accurate Grading—High Capacity.

2 Selective Throw.

3 Powerful Positive High Speed.

4 Oil—Not Grease.

5 Automatic Screen Cloth Tension—each deck independently changed.

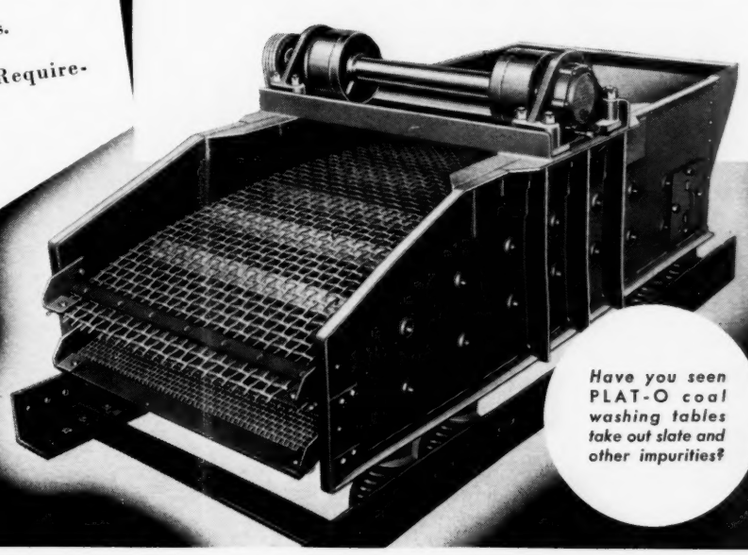
6 Vibration Fully Cushioned.

7 Only Two Bearings.

8 Lowest Power Requirements.

## DEISTER MACHINE COMPANY

**FORT WAYNE, INDIANA**



*Have you seen PLAT-O coal washing tables take out slate and other impurities?*

Central Pennsylvania's greatest difficulty in marketing has been competition of its mine-run with low-priced Southern slack. The South, which makes a lot of lump, sold it in the Middle West at good prices and its slack was dumped on the Eastern market. Under the Guffey Act it cannot continue that practice, Mr. Clark stated. Southern producers may have consolidated their gains against the Northern fields in certain areas long since taken over, but can no longer extend those gains by dump prices far below the cost of production. "Our coals make but little lump . . . and the South raided our industrial markets at the expense of the domestic consumer in its Western markets."

### Uneconomic Mines Will Fail

In regard to the present administration of the act, he continued, "I want to pay tribute to the integrity and efficiency of the new administrative body. It is not perfect but has done a better job than most coal operators believed possible and has earned the confidence of the industry in its fairness and honesty. The inevitable effect of the act is to put out of existence the top layer of uneconomic mines."

It should be taken for granted that there is no such thing as an explosion-proof mine, said E. E. Quenon, assistant mining engineer, Safety Division, Bureau of Mines, Pittsburgh, and officials and miners should be trained accordingly. He contended that most mine officials have had no disaster experience and that operating experience is of little value in such emergencies. The most important considerations for conducting rescue and recovery work are: (1) efficient organization, (2) adequate and proper equipment, (3) sufficient materials and (4) proper procedure in performing the work.

He pointed out how time and again improperly equipped miners and officials have made the fatal mistake of rushing into a mine after an explosion without regard to their own safety. With just a little thought they would realize that if the atmosphere is safe for them to travel underground, it also is safe enough for the miners to escape without assistance.

Some things that should be done immediately after mine fires and explosions are: examination of the ventilating fan and, determined by a committee of the proper officials, perhaps the reversal of its motion. The fan attendant should act only on written orders. Electricity should be cut off and remain so until definitely determined that it will not create a hazard.

If possible, underground employees should be warned by telephone and given information to enable them to escape. Officials of connected mines should be notified so their employees may be protected. All persons trained for assistance should be notified. Mine entrances should be roped off to insure the safety of onlookers. Roads should be kept open for rescue work. Persons on guard duty should be properly instructed and have police powers. Rescue workers should wear some sign of identification.

A competent coal-mining man or inspector, he continued, should be given charge with complete authority. Also there should be an advisory committee. Persons engaged in the rescue work should be carefully selected, trained and assistants appointed. Mine air should be periodically sampled and analyzed to help guide the rescue procedure. The method of rescue should be carefully planned and its progress closely watched.

Mr. Quenon mentioned the excellent work of the Bureau and its many publications and rescue courses. He urged that all officials and mine workers avail themselves of this information.

Any safety program should begin at the top, stated Morgan Watkins, safety director, Ebensburg Coal Co., for it can truly be said that careless work begins with carelessness at the top. If the officials approve haphazard methods by only watching production, then the entire organization cannot but fail to notice this attitude. A definite safety program is necessary throughout the entire organization.

### Foreman Is the Key Man

Mr. Watkins pointed out that the foreman is the key man, as he is the actual point of contact between management and the miner. He can do most to influence the workmen. Introduction of mechanical mining has brought many changes in operation which foremen previously had not been accustomed to. These changes should be clearly explained as to effect on safety as well as on operations. Hand-loading practices of the past will not suffice in a mechanized mine. Safety measures must keep pace with new machinery and methods or the ledger may show a low direct operating cost and a high compensation cost.

He stated that we too often give ourselves credit for improving the accident record of a mechanical mine that once was on hand loading when in reality certain classes of accidents have increased. As an example, statistics on two hand- and two mechanical-loading mines show that for each 1,000 tons of coal produced the mechanical mines require less man-hours of exposure and have less accidents. "It is logical to believe that as we reduce the man-hours of exposure the accidents should reduce in proportion, and if this be true the additional reduction of accidents, which in this particular case is 29 per cent, can only be credited to mechanical loading."

The changes resulting from mechanizing, he continued, can be credited with reducing four causes of accidents common to hand loading, as follows: falls of roof and slate, falls of face and sides, handling coal or slate and lifting excessive quantities of coal or slate. However, mechanizing also may increase certain hazards caused by greater speed and denser traffic. Transportation now is the most dangerous work in mechanical mines and requires closer supervision.

Special foremen meetings are important, Mr. Watkins advised; he acts as an inspector, supervisor, educator and a leader to the men under him. The section foreman is the personal representative of the mine foreman and should be thoroughly familiar with the mining laws and company safety measures. New employees should always be carefully schooled in every phase of their work.

Economic conditions of the past decade have accelerated mechanical mining to such an extent that it is becoming increasingly difficult to keep pace with the problems resulting therefrom, stated John F. Conrad, electrical inspector, Pennsylvania Department of Mines. To predict is premature but experience to date indicates that hazards with mechanical mining will be considerably less than in the past.

Naturally, he continued, the use of more equipment means increased electrical and mechanical hazards. However, the additional dangers will assume a negative aspect when adequate training programs in the use of electrical equipment are established.

## Coming Meetings

- College of Mines, University of Washington: annual meeting, Jan. 20-25, Mines Laboratory, University of Washington, Seattle, Wash.
- American Society of Heating and Ventilating Engineers: annual meeting, Jan. 27-29, Hotel Muehlebach, Kansas City, Mo.
- American Mining Congress: annual meeting, Jan. 29. Mayflower Hotel, Washington, D. C.
- American Institute of Mining and Metallurgical Engineers: annual meeting, Feb. 17-20, Engineering Societies Building, New York City.
- Canadian Institute of Mining and Metallurgy: annual meeting, March 10-12, Windsor Hotel, Montreal, Canada.
- American Mining Congress: eighteenth annual coal-mining convention and exposition, April 28 to May 3, Cincinnati, Ohio.

## Regional Meetings Consider N.C.A. Promotion Plan

Two hundred coal producers and representatives of allied interests met Dec. 12 at the Waldorf-Astoria Hotel, New York City, and considered the new advertising and market promotion program being sponsored by the National Coal Association. The report on the survey of the industry conducted by Arthur Kudner, Inc., advertising agency, in behalf of the association and the program developed by it and already adopted in principle by the board of directors of N.C.A. were presented in detail at the meeting and met with strong approval from those present. C. C. Dickinson, president of N.C.A., presided.

The program under consideration embraced a three-year plan contemplating expenditure of about $900,000 annually for advertising, market promotion and public relations. In launching the campaign the National Coal Association has formed an operating corporation known as Bituminous Coal, Inc., which will administer funds for the campaign provided by subscriptions based on tonnage.

According to the Kudner survey, bituminous coal is the most used fuel in all income groups, and a large portion of its market losses might have been prevented by an informed public opinion. Economy and convenience, due to technological developments, were among the points stressed in the agency recommendations. The program

# COOLS OFF ECCENTRIC BEARINGS AND USES 50% LESS GREASE

● IT USED TO TAKE practically all of one man's time to watch the eccentric bearings on shaker screens in an Illinois mine. It was his job to check bearing temperatures regularly (they were dangerously high at all times) and to lubricate the bearings frequently enough to prevent their burning out.

The superintendent realized that this was an expensive maintenance item, but he had tried a number of greases without any improvement. Finally he tried Superla Grease at the suggestion of a Standard Lubrication Engineer.

Superla Grease not only brought the bearing temperatures to a safe level, but it reduced grease consumption from six barrels a year to three.

Ask the Standard Oil Engineer in your vicinity to make a test of Superla on some bearing in your plant where you are having high consumption, maintenance or temperature trouble. These engineers seldom fail to find a solution to a lubrication problem. You can reach one of them through your local Standard Oil (Indiana) office or by writing 910 South Michigan Avenue, Chicago, Illinois.

**The eccentric bearings shown here, at another Illinois coal mine, were also overheating. Superla Grease again reduced temperatures and cut grease costs in half on this installation.**

Copr. 1940, Standard Oil Co. (Ind.)

# SUPERLA GREASE

# STANDARD OIL COMPANY (INDIANA)

...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICA

also included such activities as unification of effort on the part of the bituminous coal industry; cooperation with stoker manufacturers to stimulate research in automatic stoker design; and educational program for users of coal designed to eliminate stoking abuses; and stimulation of off-season sales.

Brief remarks in favor of the program were made by J. E. Tobey, vice-president in charge of engineering, Appalachian Coals, Inc.; W. J. Clothier, president, Boone County Coal Corporation; Heath S. Clark, president, Rochester & Pittsburgh Coal Co., and former president of N.C.A.; J. Noble Snider, vice-president, Consolidation Coal Co.; Charles Dorrance, president, West Virginia Coal & Coke Corporation; R. E. Jamison, vice-president, Jamison Coal & Coke Co.; W. P. Anderson, Eastern representative, Raleigh Coal & Coke Co.; George W. Reed, vice-president, Peabody Coal Co.; E. Kelly Downey, representative, Red Jacket Coal Sales Co.; R. L. Ireland Jr., president, Hanna Coal Co., and George S. Baton, president, Baton Coal Co.

Similar meetings were held at Chicago on Dec. 17 and Cincinnati on Dec. 19.

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### Midwest Power Conference Plans Two-Day Session

Midwest Power Conference will hold its 1941 meeting April 9 and 10 at the Palmer House, Chicago. Sponsored by the Illinois Institute of Technology (formerly Armour Institute of Technology) with the cooperation of seven other Midwestern universities and colleges and the local sections of the founder and other engineering societies, the conference is entering its fourth year under the present sponsorship.

The tentative program of this year's meeting, as outlined by the directorate of the conference, includes sessions on central-station practice, stationary prime movers and plant auxiliaries, hydro power, electric power transmission and distribution, feedwater treatment, and industrial power plants.

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### Presents New Stoker Size

Chicago, Wilmington & Franklin Coal Co., Chicago, has introduced a new size of stoker coal, known as "Orient Airflow Stoker." A little larger in top size than the producer's "Orient Supertherm," it is said to be a carefully regulated mixture of choice coal part water-washed, part air-cleaned, and thoroughly dust-proofed before shipment.

•

### To Add 25 Byproduct Ovens

Alabama By-Products Corporation has contracted with the Koppers Construction Co., Pittsburgh, Pa., for the construction of 25 byproduct coke ovens of the Becker type to increase its Tarrant (Ala.) plant to 174 ovens and raise its coke production to between 600,000 and 700,000 tons annually. There will be a corresponding increase in facilities for production of byproducts. About eleven months will be required to construct the new unit.

## Lubrication and Maintenance Share Stage At Indiana Institute Meeting

MAINTENANCE of mine equipment and its lubrication shared honors with the prevention of mine explosions as topics at the 1940 winter meeting of the Indiana Coal Mining Institute, held at the Hotel Deming, Terre Haute, Ind., Dec. 14. The banquet, with W. P. Allyn, Indiana State Teachers' College, as toastmaster, and Dr. C. T. Malan, Indiana Superintendent of Public Education, as speaker of the evening, was featured by presentation of the John A. Templeton Safety Trophy, awarded each year by the Indiana Coal Operators' Association to the Indiana mine making the best safety record to the Crown Hill No. 6 mine of the Clinton Coal Co. With a grade of 85.2 per cent of perfect for the fiscal year ended Oct. 31, 1940, the Crown Hill record was: man-hours of exposure, 247,488; lost-time injuries, 11; days lost, 488; severity rate, 1.97; frequency rate, 44.44. Runners up were the Dresser mine, Walter Bledsoe & Co., with 81.1 per cent, and the Baker mine, Templeton Coal Co., 1939 winners, 79 per cent.

"With the mining industry becoming more and more mechanized, the work of the maintenance departments has been greatly increased, not only from the point of quantity of labor but more so from the points of speed, accuracy and efficiency," declared Harry Cruikshank, chief electrician, Dresser mine, Walter Bledsoe & Co., in opening a discussion of maintenance of mine equipment for maximum production. "The value of a piece of mechanical equipment is not measured by its ease of operation or its streamlined looks but by the tons mined against the total possible working hours or shifts." To cope with the problems of modern mechanization, the mine electrician must be able to establish pleasant relations with management and machine operators, and must be able to cooperate and obtain cooperation. And if he is to be efficient he must have "good practical knowledge of all phases of mining," as well as its theories, and a willingness "to try new ideas and keep up with new equipment."

Dresser equipment includes eight Joy 8-BU loaders, eleven Goodman 112-AA short-wall cutters, eleven Chicago Pneumatic drills, one 150- and one 200-kw. General Electric converters, six 6-ton 4½-m.p.h. locomotives for gathering, three 6-ton 6½-m.p.h. locomotives for relay service and one 10-ton 9½-m.p.h. main-line locomotive. The mine works two shifts per day.

#### Overhaul Locomotives Yearly

"All ten of the locomotives are used on the day shift and nine on the second shift. Most of them also are used on the third shift for delivering supplies and recovery work. Lubrication and minor repairs to such parts as controllers, reels and cables is done on the third shift. Because of the constant use of the locomotives they are completely overhauled once a year, this work being done on the day shift when the mine is idle. By carrying extra parts, such as armatures, journals, brake rigging, etc., the work can be done in stages until the locomotive has been completely overhauled.

"Worn parts are reconditioned in the machine shop and made ready for the next locomotive. The journal bearings, armature bearings, boxing liners and trucks have not been renewed on any of the 6-ton locomotives in the last five years and they show very little wear at the present time. This is due to regularity of lubrication and periodic inspection. Two major breakdowns have been experienced with the nine 6-ton locomotives in the last five years, one a broken armature shaft and the other a broken armature band. Total loss of time was 7 hours.

"The 10-ton G.E. locomotive was purchased in 1933 and never has had a major breakdown. Two hours of time have been lost due to minor adjustments in the last seven years. Repair parts used on this locomotive to date are: two armature pinions, one set of journal bearings, one set of journal liners, one set of tires, five sets of brake shoes, two sets of armature brushes and a few controller parts.

"At the present time, six loading machines are used on the day shift and five on the second shift. The machines all are lubricated, inspected and minor repairs made on the third shift. Due to a low seam and bad roof with protruding boulders, these machines often become wedged under the boulders and crossbars, causing excessive stress and increasing maintenance. The machines are overhauled completely after being in service five to six months. The time required is cut down by having on hand complete assemblies of such parts as clutches, loading tables and loading booms. The assemblies replaced are taken to the machine shop where they are torn down,

### Indiana Officers

H. A. Cross, general superintendent, Walter Bledsoe & Co., was elected president of the Indiana Coal Mining Institute at the annual meeting in Terre Haute, Dec. 14. Mr. Cross succeeds R. A. Templeton, vice-president, Templeton Coal Co. Other officers and members of the executive board are:

Vice-Presidents—A. K. Hert, superintendent, Snow Hill Coal Corporation; F. M. Schull, Binkley Mining Co.; and D. W. Jones, superintendent, Princeton Mining Co.

Secretary—Harvey Cartwright, commissioner, Indiana Coal Operators' Association.

Executive Board—Birch Brooks, superintendent, Saxton mine, Walter Bledsoe & Co.; H. M. Ferguson, president, Clinton Coal Co.; Crede Fitzpatrick, superintendent, Black Hawk Coal Corporation; Peb Conrad, superintendent, Knox Consolidated Coal Corporation; Fred Bieler, mine manager, Snow Hill Coal Corporation; Joseph Anstead, electrical engineer, Templeton Coal Co.; and R. A. Templeton, vice-president, Templeton Coal Co.

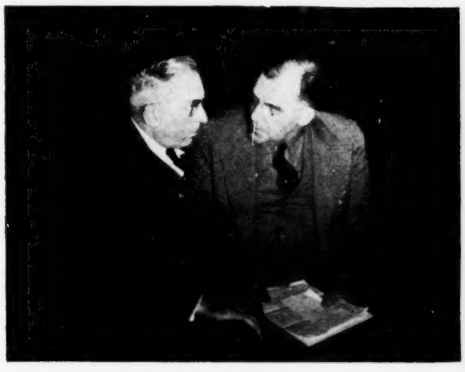
James Guiney and W. J. Lewis, Princeton Mining Co., show pictures of a greasing machine to Joseph Anstead, Templeton Coal Co., and H. S. Lowry, Snow Hill Coal Corporation.

Fred Ferguson, Indiana chief inspector, and Fred Bieler, Snow Hill Coal Corporation, talk things over.

Harry Cruikshank, Walter Bledsoe & Co., and William Wampler, Knox Consolidated Coal Corporation.

W. H. Tomlinson, Bureau of Mines, snapped with R. A. Templeton, Templeton Coal Co., and retiring institute president.

Dresser mine delegation, headed by H. A. Cross (center), general superintendent, Walter Bledsoe & Co., and new institute president.



D. W. Jones, Princeton Mining Co., and Harvey Cartwright, institute secretary, confer.

Bosses from Crown Hill No. 6, Clinton Coal Co., winners of the John A. Templeton trophy, pose with H. M. Ferguson, president (left of cup), and D. W. Hayes, general superintendent (right).

A. K. Hert, Snow Hill Coal Corporation (left), chats with Birch Brooks, Saxton mine, Walter Bledsoe & Co.

Western Kentucky delegation: left to right, Ray Gabbard, Richard Hundley, C. M. Rodman and Ward Padgett, all of Crescent Coal Co.

## Permanent Display of Stokers Opens

Chicago's permanent display of stokers opened early in December in the Merchandise Mart. Undertaken and sponsored by the Midwest Stoker Association, with the cooperation of leading building-material manufacturers, heat-control manufacturers, and the Chicago Coal Merchants' Association, the display is expected to prove an influential factor in the home-building activities in the Chicago area by illustrating the many advantages of automatic coal heat to prospective home builders. The stoker display will be open for at least two years and changes in the equipment and layout will be made at regular intervals. At present hopper model burners are shown, but a complete unit incorporating bin-feed burner, furnace and air conditioner, with glass coal-storage bin will be displayed during the coming spring.

inspected and worn parts replaced. At this point, excessive maintenance often is eliminated, as the cause of such wear, breakage, etc., is found during this inspection.

"Inside the mine a sub-shop is located where a stock of parts that experience has taught us we might need is maintained for minor repairs. An electrician or repairman is stationed at this shop," and has at his disposal a motorized truck for taking parts to a breakdown without loss of time. "Repair parts such as hoses, swing ropes, brake bands and conveyor-chain parts, together with suitable tools, are kept on each section and such repairs in many cases are made by the men on the job.

### Cutters Lubricate Machines

"The eleven cutting machines are equipped with 7½-ft. bars and 20-in. feeds. Lubrication is done by the operators, who are supplied with a gun holding 3 pt. of oil for high-speed bearings and a pint of low-grade oil for rope drums and sheaves. These quantities are sufficient for a shift of 7 hours. After a complete overhaul of one of these machines, it was put on a triple-shift basis, cutting 45 places per day five days a week for three months. Total places cut was 2,700 with an approximate tonnage of 35,000. This machine had no lost time during this three-month period.

"Due to hard cutting in the No. 5 seam, the life of cutter bars and chains is short, averaging about 60,000 tons for a chain. To get the maximum wear from chains, it is necessary to rebuild the cutter bars three to four times. By such renewals, many other causes of breakdowns, such as armature burnouts, heating of bearings, broken shafts, wear on gears and excessive use of power, can be eliminated."

Both converters at Dresser are within 50 ft. of each other in the center of the loading area. The mine is divided into three sections, with transmission distances of 3,500 to 4,500 ft. Feeders are 500,000-circ. mil cables insulated to reduce loss of time from power interruptions from falls of slate and derailments of cars. Insulated feeders also are safer. Returns consist of two 4/0 wires and two bonded track rails. Two 4/0 lines, with all splices soldered, are used on room panels.

Wiring and bonding is done by experienced men supplied with a motor-driven tool-and-wire truck (*Coal Age*, February, 1939, p. 82). On the main haulage roads, a 4/0 wire hung on the rib is tapped into the track every 300 ft. In addition to reducing voltage drop in the track and acting as standby connections in case of broken bonds or rails this wire permits rapid bond testing by means of a clip-over type d.c. ammeter (Tong-Test) applied on each side of each tie wire. If a high ampere reading is noted on one side of the tie wire it is an indication that one or more bonds are bad in that 300-ft. section of track (*Coal Age*, December, 1938, p. 116).

### Transformers Near Faces

Another type of loading equipment and the use of a.c. power offer a different set of conditions as compared with Dresser, stated Walter Wampler, chief electrician, Knox Consolidated Coal Corporation. A.c., he declared, complicates the distribution problem. A 2,300 primary circuit is installed in the main entries, with safety oil switches at taps into cross entries and at transformers, which are installed in fireproof tanks. These transformers are kept as near the centers of the working territories as possible for maximum efficiency. Secondary distribution is by means of 4/0 wires, and safety nip boxes are used to prevent burns and shock (*Coal Age*, January, 1935, p. 36).

Cutting machines are about twenty years old and the first loaders were bought about 1931-32. They now are producing, on a double-shift schedule, about 400 tons each per shift. Maintenance of the equipment is quite a job for the crew, which must be on the job and know its business. One man is assigned to two territories and no maintenance work is done on the third shift. Rather, it is done when the opportunity offers during the working periods. Major repairs are made over week-ends. Parts units are built up in the main shop to save installation time. One man in this big shop inspects and repairs locomotives. Small shops are built in each territory where a supply of parts most frequently needed and light enough for the repairman to handle are kept, while other essential parts and spare units of such equipment as drills are kept in the big shop. With no extra loader, a complete list of parts frequently required is a vital consideration.

Due to the extremely hard cutting, which makes a 7½-ft. bar about all a 50-hp. shortwall can carry, care must be taken to make sure that bits are changed when needed. Bit blocks on the Cincinnati chains, although hard-surfaced when received, are resurfaced with Borod from time to time. A good d.c. power supply is assured by one 300- and two 200-kw. sets about 2,000 ft. apart. The 200-kw. sets are adjusted to undercompound at about 750 amp., throwing any extra load on the 300-kw. unit. Under this set-up, very little trouble is incurred in haulage.

Cooperation between mine bosses and repairmen, concluded Mr. Wampler, is essential to the smooth and continuous functioning of production equipment. To determine the nature of breakdowns, their cause and how much time is required in repairs, a report system is being installed for repairmen which will supplement the reports of section bosses.

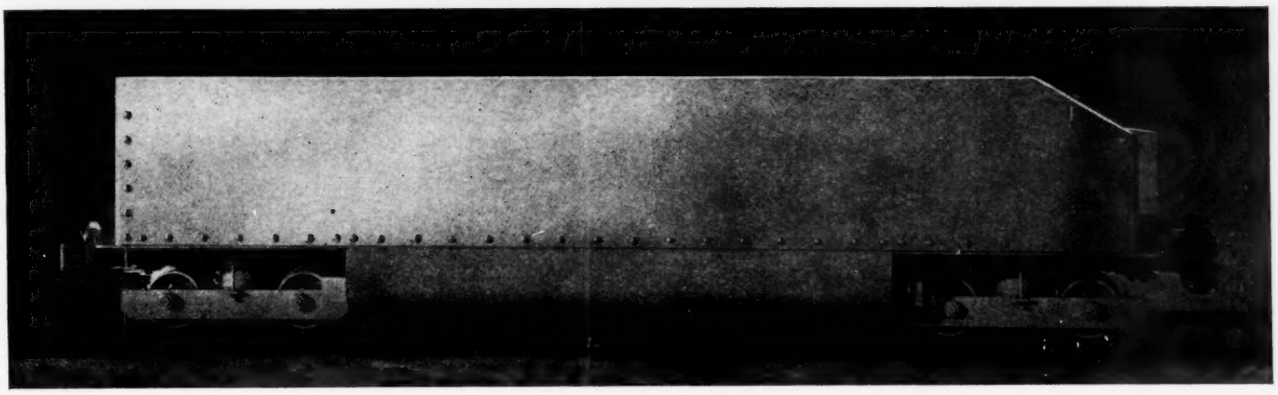
### Importance of Lubrication

"Lubrication of mining machinery, with our present employment of many types of mechanical devices and our stepped-up methods of production, has grown to a problem of such size and importance that it must receive full consideration if cost of production is to be held to a minimum," declared H. S. Lowry, chief engineer, Snow Hill Coal Corporation. "In all probability, very few industries present the severe conditions that usually are encountered in underground mining. From a lubrication standpoint, the conditions of particular interest are: the presence of abrasive material, generation of heat in machines of certain types, excessive loads placed at times on moving surfaces, and the difficulty of keeping machines adequately lubricated at all times. These, coupled with the varied types of surfaces and bearings to be lubricated, present a fairly tough problem where cost of production is to receive due consideration.

An unlimited range of lubricants is available for underground use, "but it is good practice to confine the types and weights to as low a number as possible, especially in underground work. Too many kinds are confusing and the wrong application is likely to result in failure. . . . Only careful supervision and experimentation can determine the best lubricant to use for any troublesome installation."

When the equipment at "our Talleydale mine" was new, lubrication costs, of course, were low, even though it is subjected to as hard a service as any in the State. But

*DIFFERENTIAL STEEL CAR COMPANY, FINDLAY, OHIO*



# CUT COSTS WITH DIFFERENTIAL MINE CARS

## 8-Wheel Axless Trucks — Large Capacity

Differential Cars increase capacity of loading machine (see graph below).

Differential Cars reduce initial investment because fewer cars are needed to equip a mine.

Differential Cars reduce compensation claims. High degree of roadability restricts derailments and reduces accidents.

Differential Cars reduce maintenance cost. There are fewer cars to maintain and the major maintenance caused by derailment is avoided on account of the roadability of the AXLESS truck.

Differential Cars reduce road-cleaning costs because the cars are tight and, furthermore, ride the track smoothly at high speeds without shaking off the topping.

Differential Cars save in track maintenance because wheel loadings are reduced, wheel loadings are equalized, and the AXLESS truck negotiates curves without wheel flanges crowding the rail.

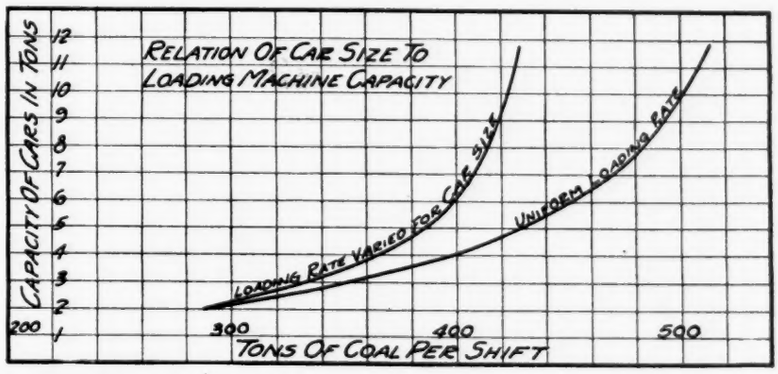
Differential Cars save power. Rolling friction reduced on both curves and tangents. Favorable live load ratio saves appreciably on power.

Differential Cars reduce wheel wear. Wheel flanges do not crowd rail. No wheel slippage on curves.

Differential Cars permit greater capacity within given clearance limitation. 8-Wheel design allows for proper balancing and maximum body size with simple construction.

Higher safe speeds of Differential Cars cut costs because fewer cars are needed and fewer locomotives.

The graph on the right illustrates how increasing car size will increase capacity of loading machine and therefore reduce the cost per ton of coal. This graph was developed under actual conditions and a different set of mining conditions might not give this result but the relation between mine car size and tons per shift would remain closely proportional. The increased capacity shown includes only that due to reduction in car changes. Other factors further increase capacity.



WRITE FOR BULLETIN D-51

# DIFFERENTIAL CAR & LOCOMOTIVE WORKS

FINDLAY, OHIO

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**Mine Locomotives Mine Cars Dumping Devices 3-Way Dump Larry Cars**
**Burden-bearing Locomotives Haulage Equipment for Strip Mines**
**Stock-piling Cars Complete Haulage Systems**

with longer service, cost began to rise. A study revealed that consumption, gear- and clutch-case operating temperatures, and failures from faulty lubrication were much too high. "Working principally with the loading machines, we tried several types of oils and greases in the transmission and gear cases in an effort to find a lubricant that would stay in the case, lower the operating temperature, provide ample lubrication, and at the same time lower the initial cost, if possible.

### Many Lubricants Tested

Lubricants tested ranged from fluid greases to light motor oils, "and it was found, as might be expected from the viscosity curves," that all of them thinned down under normal operating temperatures to about the same consistency. "The operating temperatures referred to were determined by a series of normal- and no-load tests on the transmissions of machines in good mechanical condition and containing an adequate supply of lubricant." None of these testing temperatures was high enough to be destructive, but occasionally loss of lubricant or mechanical failure raised the temperature sufficiently to change the character of the lubricant, with consequent overheating and serious damage to the machine parts affected.

"We also found that the transmissions of machines consuming an average quantity of oil reached normal temperature in the first three to four hours of the shift and had lost about 90 per cent of the 7-hour total during that same period. Quite naturally, these losses increased the temperatures somewhat above normal during the remaining three hours regardless of the initial weight of the oil, grease or compound used," due to the fact that as temperature increases the viscosity curves of the various types of lubricants converge, so that at normal operating temperatures the difference is less than 50 sec. This placed all the types "within a range that offered very little toward the reduction of loss through leakage." The tests, however, "reduced the problem to one of lubricating qualities only, which should be the prime consideration in any choice of lubricant. In other words, these tests indicated that a good-quality pure mineral oil of a viscosity suitable for a wide range of applications was advisable. Since such an oil could be purchased at a lower cost than the lubricant previously used, a saving was made and, if anything, the operating efficiency of the machine increased.

### Savings by Servicing

"The possibility of savings through the method and frequency of servicing machines is worthy of mention because of the difficulty of providing a supply of clean lubricant at the machines and its application in the right quantity at safe intervals. The delivery problem is best solved, I believe, by the portable pressure tank, by means of which clean oil and grease can be applied in measured quantities with sufficient pressure to clean out and lubricate any part of the machine. . . . However, a good job of hand lubricating can be done from centrally located clean oil stations by competent service men who, by working with the same machines each shift, are thoroughly familiar with their needs.

"We employ two two-man crews, each crew being responsible for the lubrication and repair of four loading machines per shift. Reports are made out daily for each machine by these service men, and a study of these reports, plus a weekly inspection of the machines, provides a fairly accurate picture of their general condition. . . . In the past, some trouble has been encountered from the entrance of dust and dirt into certain bearings, particularly those located close to the coal stream. Attempts to seal these bearings effectively for any length of time seemed next to impossible, due to the great quantity of abrasive dust found in our No. 3 coal. However, we found that by flushing these bearings every seven hours with oil and then adding pressure grease where the oil alone would not provide sufficient lubrication, the problem was well taken care of.

### Prevent Lubricant Losses

"The possibility of reducing lubrication costs by preventing loss of lubricant from the machine itself probably offers more room for improvement than any other method. . . . We found our loading equipment to be using entirely too much lubricant, especially gear cases holding from 1 to 8 gal." Since the tests showed practically no chance of reducing this loss by changing quality or type, "at least within reasonable cost limits, this became strictly a mechanical sealing problem. . . . Further study showed that about 6 per cent of the lubricant used on loading equipment was going through the transmission cases alone. This meant that the cases must be sealed to retain a sufficient quantity of lubricant, at normal temperatures, of about the viscosity of a light fuel oil, not only for cost reduction but to prevent abnormally high temperatures which would further increase loss and damage to mechanical parts."

Correcting this condition involved very little expense, most of the work being done underground on idle days. It consisted chiefly of "increasing the size of part of the assembly screws, the addition of one new seal, the use of a new type of sealing compound and gasket material and the renewal of all seals on the shafting extending from the case." Experience on the first machine resulted in a quick going-over for the remainder, hitting only the most troublesome spots, "but in most all cases resealing the transmission-to-motor joint. We are now making a second round of the machines, sealing the remainder of the cases in a similar manner.

"The incomplete results are: Consumption of lubricant by the transmission cases of seven full-time machines has been reduced 68 per cent, the first machine completely sealed using a total of 1½ gal. of oil in 60 full 7-hour shifts. Operating temperatures are normal. Sealing of part of the other gear cases has produced a drop of 15 per cent for a total, with the sealing programs approximately two-thirds complete, of 48 per cent in the lubrication of our loading equipment. This represented in November, when combined with the initial cost reduction, a saving of 5 per cent in the lubrication of all underground equipment. The saving in wear and tear can only be estimated," concluded Mr. Lowry.

"Lubrication in most other industries is a specialized operation and we in the coal industry must bring ourselves to a realization of its importance," declared Joseph Anstead, electrical engineer, Templeton Coal Co. Reducing lubrication cost does not necessarily mean reducing the quantity of oil used where it is needed but in cutting the waste at points where it is not needed

**Crescent Coal Co. Team, Winner of West Kentucky First-Aid Meet**

Paradise team of the Crescent company compiled a score of 398 in the contest at Dawson Spring, outdistancing fifteen competitors. Standing, left to right: Ward Padgett (captain), Theodore Clayton, Harry McKee, Ed Mercer and Rufus Burch. Kneeling: Troyce Santy.

# *Coal and Ore Handling...* ALL YEAR ROUND

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or even harmful, such as in motor windings. "By using no more lubricant than was necessary and by applying the proper lubricant to a specified job we would in turn be increasing the operating efficiency of mining machinery."

The Templeton organization some time ago embarked on a study of the lubrication problem and decided to build a lubricating truck, as it was felt that costs could be materially reduced by abandoning the use of cans, buckets and similar containers, with accompanying likelihood of spillage, leakage and contamination, for transporting oil. The oil truck provides for quick, clean metered delivery under pressure to all parts of the loading machine. With a pressure of 150 lb., the truck is designed with a 120-gal. oil tank and space for a drum for special applications. A low-pressure hose handles oil from the tank and a high-pressure hose leads out from the drum to fitted loader bearings.

In considering the proper type of lubricants, it was found that the oil used in making the grease used in the loading machines had a lower viscosity than straight oil suitable for the job. Therefore, since the grease would be thinner at the operating temperature in the loader bearings—usually rather high-smoking and fuming under severe operating conditions could be expected. Consequently, it was decided to use oil.

### Lubrication Records Kept

The next problem was selection of the proper oil for conditions prevailing at New Hope mine. An accurate record is kept on each loader each shift, broken down into quantity used in each gear or clutch case, chain cases and pressure-lubricated bearings. The daily records are transferred to a monthly chart showing at a glance consumption on any part of the machine, as well as the machine as a whole. The charts also indicate when a machine should go into the shop for an overhaul, and it is believed that they also will save time in overhauling by directing attention to points where it is most needed. In the short time the system has been in effect it is felt that most of the waste has been eliminated, as oil consumption already has been reduced approximately 50 per cent.

A uniform quantity is applied each shift to pressure-lubricated fittings, chains, etc. Application at other points varies with the condition of the machine and the levels to which the cases are filled. With the truck, it always is possible to get every bearing to take oil. The loader can be lubricated in half the time, giving the men more opportunity to change bits, make minor repairs, etc. Spillage and leakage is eliminated and clean delivery assured.

Clutch and gear life, on the basis of experience to date, it is believed, will be substantially lengthened and bearing costs cut. Much of the coal at New Hope is 4½ to 5 ft. in thickness and the loading machines average 100 cars (4½ tons of clean coal per car) per shift. With the present system, Mr. Anstead said in conclusion, a loader can be lubricated efficiently at a cost of 1½ mills per ton of coal loaded, which is the goal for the future.

Some of the difficulties encountered in the lubrication of loading machines, said James Guiney, master mechanic, Princeton Mining Co., are: careless handling of oil barrels and grease drums; waste in transferring contents from containers into machines; leaving oil barrels and grease drums open so that oil and grease are contaminated with fine dirt and dust; emptying oil and grease from barrels and drums into dirty buckets, with resultant contamination of the lubricant in clutch and transmission cases, damaging gaskets and bearings; and destruction of seals by dirt in oil, wasting the lubricant, its loss causing clutches to heat and burn. "All of the above problems result from careless handling of lubricants, which proves costly, first, in expenditures for oil and grease; second, in damage to machinery and cost of repairs; and, third, in loss of production while these machines are out of service."

### Systemless Methods Wrong

Before April, 1937, oil and grease was handled in drums and barrels at Kings mine and the lubricant was poured into machines from cans and buckets. Considerable loss resulted from spillage in filling guns and cans and there was an ever-present risk of contamination. All Alemiting or greasing was done by hand with a hand gun or common hard-oil cups—usually during car changes or other machine stoppages, or the machine was shut down long enough for this operation. Records were impossible and no one knew if a machine was properly lubricated, how much lubricant was used, how much was wasted in handling or whether transmission cases were leaking or running dry until the machines went down. "The results were improper lubrication, wastefulness, inefficiency and loss of the operating time of the machine."

Kings mine uses six 5BU, one 8BU, two 10BU, two 11BU Joy and two 260-A Goodman track-mounted loading machines, and three track-mounted cutting machines (one 29-LE and two CLU's). All work two shifts a day. To lubricate this equipment, two portable greasing machines have been built at the mine. Each is mounted on a mine-car chassis and includes a traction-type automatic air compressor which automatically maintains a pressure of 120 lb. per square inch at all times, including moving; two 150-gal. tanks, one divided into 50- and 100-gal. compartments by a bulkhead, flow meters for each type of lubricant, a high-pressure Alemite gun and 40-ft. hoses for each of the three types of lubricants. The 150-gal. tank is filled with loader grease, the 100-gal. compartment with hydraulic oil and the 50-gal. compartment with No. 30 lubricating oil (used in the hydraulic system of the 10BU machines). Locomotives move the greasing machines from place to place.

### Greasing Machines Used

Each machine is operated by a crew of two men. "All of the lubricating is done underground on the third shift, which means that each machine is greased once for each 14 hours of service. Both grease machines are filled with oil and grease on top during the day shift. . . . When filled, each contains enough of each oil and grease to service each loader and cutting machine assigned to it twice before it is sent out on top to be refilled. . . . The men operating the grease machines are supplied with regular forms so that a record of the quantity of oil and grease passing through each meter into the different clutch and transmission cases of the loading and cutting machines can be kept. These reports are turned in to the underground supply clerk at the end of the shift.

"A further record is posted in the supply room below so that the one in charge of underground maintenance on each shift can see how much lubricant is used on each unit of each loader and cutting machine. Thus, on numerous occasions, the man in charge has been warned by these reports of a defective oil seal or a leaky transmission case before the repairman or machine operator located it. The records of the quantities of grease used on each machine then are turned in to the clerk in the office, who checks them against the quantity of grease and oil in each barrel as the grease machine is filled on top. From these daily records we are able to ascertain the cost of lubricating each machine; also, how much oil and grease is in stock at all times. From the daily consumption reports it is possible to prepare a summary at the end of each month showing the actual cost of lubrication per ton of coal produced. While this figure may vary from month to month over a period of years, a very good average can be obtained, indicating a trend toward better or worse equipment condition."

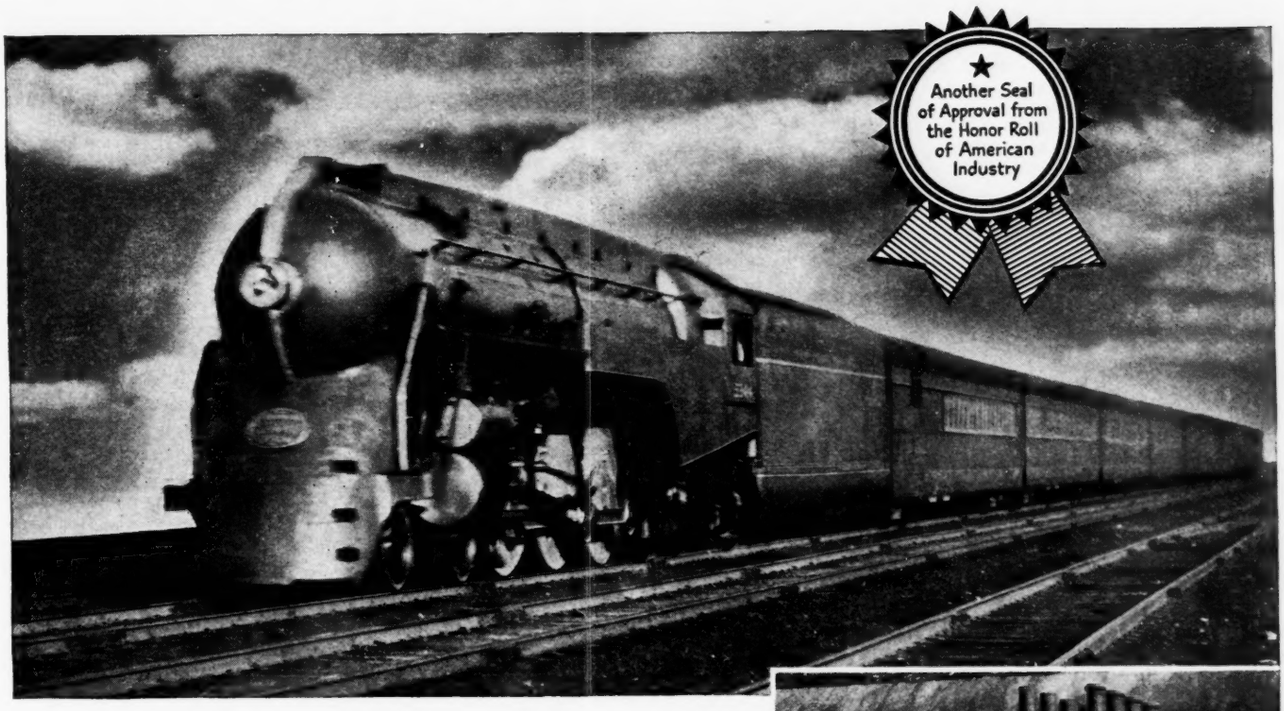
### Control Lubrication Costs

The most important function of a greasing machine is to prevent waste. "If particular attention is given to preventing waste of lubricants and maintaining equipment in such condition that the quantity of lubricant consumed is reasonable, the cost of lubrication is completely under control and the matter of reducing lubrication costs without decreasing operating efficiency of mining machinery is solved."

"Coal-Mine Explosion Prevention"—a sound movie by the U. S. Bureau of Mines—was the concluding feature of the technical sessions. Running something over an hour, this movie illustrated methods of preventing ignitions by proper ventilation, use of permissible equipment and closed lights, keeping down dust by water on cutter bars, sprinkling coal and cars, etc., the use of rock dust and the proper handling and use of explosives.

Pointing to the 267 fatalities so far in 1940 as a result of major disasters, W. H. Tomlinson, associate mining engineer, U. S. Bureau of Mines, Vincennes, in his introductory remarks, challenged anyone to give a reasonable excuse for their occurrence. In addition to the five major disasters, he stated, there were at least a dozen other ignitions killing one to four men each.

Much progress was made in the prevention of explosions in the period 1931–39, while the results for 1939 and so far in 1940 show that gains in the prevention of deaths from other causes are being held and increased. With explosions, however, the trend seems to be backward, in spite of the fact that prevention requires only good housekeeping and the exercise of common sense. Executives in particular, Mr. Tomlinson contended, should take steps to make sure of their own knowledge that their mines are protected against the hazards of an explosion, which may mean, aside from the humanitarian angle, the difference between profit or loss for many years.

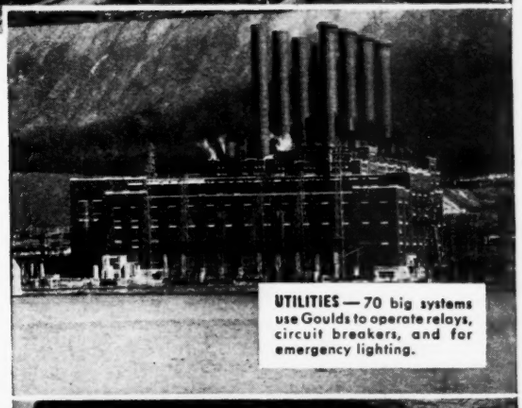



# WHY THE MERCURY STAYS PUT ON "THE MERCURY"

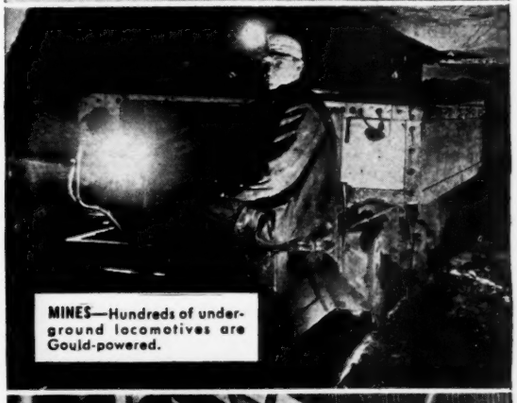
Outside, it may be ninety-eight in the shade. But aboard New York Central's "Mercury", the several hundred passengers ride in cool comfort. Nowadays, there's nothing novel about air conditioning. The public doesn't care how it's obtained, just so it's there. But railroad men *do* care. That's why so many car air conditioning units are Gould-operated. You'll find Goulds on the "Mercury", the "Hiawatha", the "400", the "Rockets", many another popular train.

On the Gould list are 55 major railroad systems that employ this famous battery for air conditioning, car lighting, car retarding and for operating block signals.

Three words tell you why—dependability, long life.



**UTILITIES**—70 big systems use Goulds to operate relays, circuit breakers, and for emergency lighting.



**MINES**—Hundreds of underground locomotives are Gould-powered.

**INDUSTRIAL TRUCKS**—Goulds help them run longer between charges.

## For Over 40 Years Gould Has Made Batteries for Every Industrial Application!

**GOULD PLANTE:** *Guaranteed 14 years* in floating service. Maximum life with highest sustained capacity under all operating conditions made possible by exclusive one-piece pure lead spun plate process.

**GOULD KATHANODE:** *Guaranteed from 4 to 12 years.* Spun Glass construction provides long life, light weight and high capacity at low operating cost. For all motive power and railroad applications.

**GOULD DREADNAUGHT** *Guaranteed from 2 to 8 years.* Maximum capacity and long life when pasted plate construction for low initial cost is of primary importance.

**NOTE:** KATHANODE and DREADNAUGHT batteries are available in either Glass Jar or Hard Rubber construction.

**FREE** illustrated manuals describing any of these exclusive Gould constructions are yours upon request. Write: Gould Storage Battery Corporation, Depew, N. Y.

# GOULD

### Maize Named Pennsylvania Chief To Succeed Thomas

Richard Maize was appointed State Secretary of Mines of Pennsylvania by Governor James on Dec. 3, succeeding the late John Ira Thomas. Mr. Maize has been serving as Deputy Secretary for the bituminous division. Since Mr. Thomas' death last summer, Joseph J. Walsh, deputy for the anthracite region, has been serving as acting secretary.

The new chief, who was born in Scotland 64 years ago, came to this country at the age of four and began work in the mines at an early age as trapper boy and mule driver. Becoming a miner and then foreman, he studied at Ohio State University, being graduated as a mining engineer. Besides being superintendent for the Pittsburgh & Westmoreland Coal Co. he has served at various times in the State Department of Mines as an inspector over a period of nineteen years. He was bituminous deputy, 1932-35, then returned to the Uniontown district as mine inspector, and was recalled to the deputyship when Governor James took office.

The vacancy caused by the advancement of Mr. Maize from the post of Deputy Secretary in charge of the bituminous section has been filled with the appointment of W. Garfield Thomas as his successor. Mr. Thomas was named Dec. 11. Born at Audenried, he was educated at Bellefonte Academy and Pennsylvania State College, being graduated from the latter as mining engineer in 1908. He became a chainman in the engineering corps of the old Lehigh & Wilkes-Barre Coal Co. and later joined the engineering staff of the State Highway Department. Subsequently he was employed by the Dodson Coal Co. as assistant mining engineer and by Northumberland County as Assistant County Engineer.

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### Rock Springs Honors McAuliffe

Eugene McAuliffe, president, Union Pacific Coal Co., operating headquarters of which are in Rock Springs, Wyo., was the guest of honor at a dinner on Nov. 7 in the Old Timers' Building in that city. The occasion was a testimonial to the coal company executive in appreciation of his outstanding civic efforts in behalf of the community during his tenure of office with the company. There were speeches by notables, music by the Kiltie Band, and an engraved watch was presented to Mr. McAuliffe.

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### Beckley Blast Kills Seven

An explosion in No. 4 mine of the Raleigh Coal & Coke Co., beneath the streets of Beckley, W. Va., on Dec. 17 caused the death of seven men and injuries to five others. The mine is a slope operation, and the blast occurred about two miles from the entrance. Ellsworth Shriver, superintendent, said he had no idea of the cause of the explosion. He said the operation was not gaseous and that safe lamps were used. There were about 79 men in the mine at the time of the explosion, but 58 were in unaffected areas and escaped. It was said to be the first serious accident at the mine in forty years of operation.

Richard Maize

## Personal Notes

KENNETH BARTLETT, formerly inspector in the Marion and Preston divisions of the Industrial Collieries Corporation, has been promoted by the company to superintendent of Mine 42, Barrackville, W. Va.

TOM CHRISTIAN has been made mine foreman at No. 5 mine of the Mallory Coal Co., Landville, W. Va.

RUSSEL CLARK has been named section foreman by the Guyan Eagle Coal Co., Amherstdale, W. Va.

F. M. COOPER has been appointed section foreman at No. 19 mine of the West Virginia Coal & Coke Corporation, Stirrat, W. Va.

W. L. DOOLITTLE, heretofore chief engineer, Consolidation Coal Co., has been appointed general manager of operations, vice W. J. Wolf, deceased.

H. G. ELLIS, heretofore mine foreman at No. 5 mine of the Mallory Coal Co., has been made superintendent of mines Nos. 2 and 5, Landville, W. Va.

RILEY ENGLAND has been promoted to section foreman at No. 3 mine of the Mallory Coal Co., Mallory, W. Va.

H. O. ERB, formerly with the Jeffrey Mfg. Co. and preparation manager, Mount Olive & Staunton Coal Co., Staunton, Ill., is now connected with District 11 Bituminous Coal Producers' Board, with headquarters in Terre Haute, Ind.

J. W. GARVEY, general manager, Maryland New River Coal Co., was reelected president of the New River Coal Operators' Association at its annual meeting. Other officers named are: vice-president, L. EBERSOLE GAINES, president, New River Co.; secretary and labor commissioner, S. C. HIGGINS; treasurer, P. M. SNYDER, vice-president, Koppers Coal Co.

LOYOLA GUERIN, recently with G. M. Basford Co., returned to McGraw-Hill Publishing Co., Inc., on Jan. 1 as executive assistant to James H. McGraw Jr., president. Mr. Guerin was with McGraw-Hill in research and sales capacities from 1928 to 1936, when he resigned to join Basford.

J. W. HAGER, formerly superintendent at Praco mine of the Alabama By-Products Corporation, has been engaged as assistant general superintendent by the Woodward Iron Co., Woodward, Ala.

W. E. HALL, formerly superintendent of the Marion division of the Industrial Collieries Corporation, has been named superintendent of the Preston division, in Monongalia County, West Virginia.

C. M. HOARD has been promoted from assistant superintendent to superintendent at Mine 41 of the Industrial Collieries Corporation, Barrackville, W. Va.

J. B. JAMES, formerly general mine foreman at Oakwood mine of the New River Co., has been promoted to superintendent of Summerlee mine. Both mines are in Fayette County, West Virginia.

D. S. KINGERY has been transferred by the Pittsburgh Coal Co. from the standards department to become superintendent at Somers mine, Pricedale, Pa.

R. D. LAUDER has been transferred by the Pittsburgh Coal Co. from Assistant Production Manager Clark's office to become assistant to the superintendent at Crescent mine, California, Pa.

E. Y. LUY, formerly a section foreman at Mine 41 of the Industrial Collieries Corporation, has been promoted to inspector in the Preston and Marion divisions, northern West Virginia, vice Kenneth Bartlett, promoted.

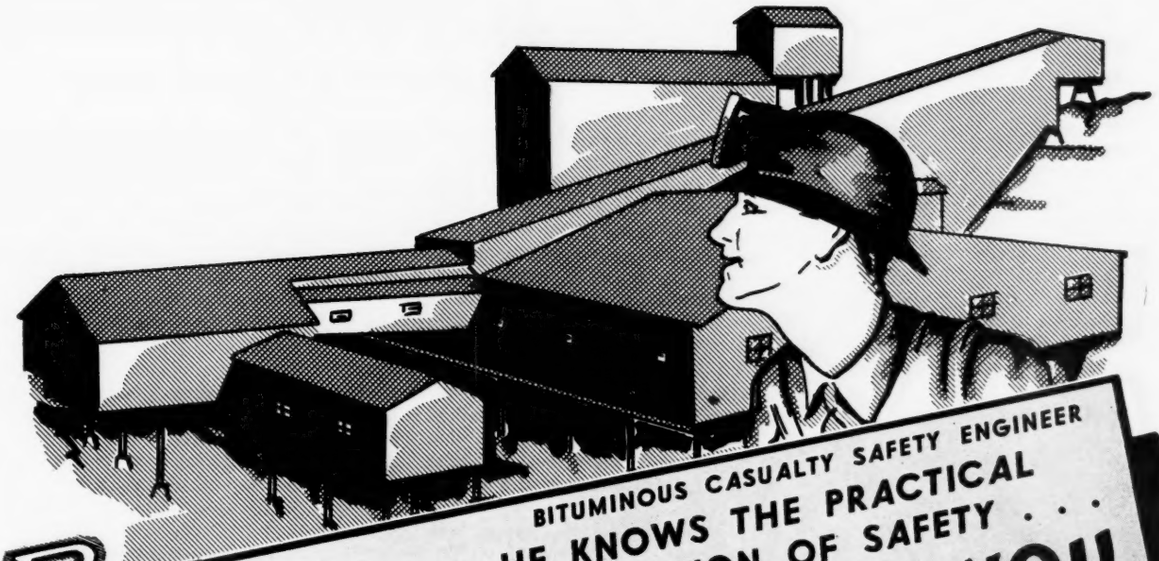
H. EUGENE MAUCK has been transferred by the Pittsburgh Coal Co. from face preparation inspector to assistant to Assistant Production Manager Bartram.

HENRY NAPIER has been promoted to section foreman at No. 19 mine of the West Virginia Coal & Coke Corporation, Stirrat, W. Va.

O. B. PRYOR has been advanced from general mine manager to vice-president in charge of operations by the Valley Camp Coal Co., with headquarters at Elm Grove, W. Va. He has been associated with the company for more than twenty years, starting as an outside day man and earning promotions from time to time.

B. H. PURSER, formerly superintendent at No. 155 mine of the Consolidation Coal Co., Van Lear, Ky., has been appointed superintendent at Praco mine of the Alabama By-Products Corporation, Praco, Ala.

I. W. ROUZER was reelected president of the Alabama Mining Institute at its annual meeting. Other officers are: first vice-president, C. F. DEBARDELEBEN, president, Alabama Fuel & Iron Co.; second vice-president, R. T. DANIEL, president, Cane Creek Coal Mining Co.; secretary, HUBERT E. MILLS; counselor, J. W. DAVISON. The board of governors includes W. F. COBB, general manager, Galloway Coal Co.; H. A. BERG, president, Woodward Iron Co.; C. F. DEBARDELEBEN JR., president, Red Diamond Mining Co.; A. R. LONG, president, Brookside-Pratt Mining Co.; HAROLD MCDERMOTT, vice-president, New Castle Coal Co.; M. E. MOOR, president, Blocton Cahaba Coal Co.; HUGH MORROW, president, Sloss Sheffield Steel & Iron Co.; GEORGE F. PETER, president, Southern Coal & Coke Co.; DAVID ROBERTS JR., president, Brilliant Coal Co.;



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the Bituminous has insured the compensation risks of the industry whose name it bears. Total admitted assets in 1940 topped the $7,000,000.00 mark and capital and surplus total $1,500,000.00. Cash and U. S. Government bonds represent 79% of total assets, and for the additional security of policyholders, there is reinsurance, in excess of $20,000 up to one million dollars to protect the Bituminous in event of catastrophe or unusual loss for every workmen's compensation policy issued.

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ROCK ISLAND ILLINOIS

D. A. THOMAS, president, Montevallo Coal Mining Co.; HERBERT TUTWILER, president, Black Creek Coal & Coke Co., and J. W. PORTER, president, Alabama By-Products Corporation.

JAMES SEVICK has been appointed assistant superintendent at Mine 42 of the Industrial Collieries Corporation, Barrackville, W. Va.

JULIAN E. TOBEY, vice-president in charge of engineering for Appalachian Coals, Inc., Cincinnati, has been appointed by Governor Bricker of Ohio to membership on the State Board of Registration for Engineers and Surveyors. Besides being a registered professional engineer in Ohio Mr. Tobey is a member of the American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and National Association of Power Engineers, Inc.

W. V. WHITEMAN, hitherto chief engineer, United States Coal & Coke Co., has been moved from the Gary (W. Va.) office to Pittsburgh, Pa., to become staff engineer of the company's coal subsidiaries. A. E. DUCKWALL, heretofore division engineer at Lynch, Ky., succeeds Mr. Whiteman as chief engineer of the West Virginia and Kentucky divisions with headquarters at Gary.

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## Call Gas Lines Prejudicial To Defense Program

Opposing a number of proposals for natural-gas lines now before the Federal Power Commission, coal and allied interests have attacked the schemes in a memorandum to the National Advisory Commission to the Council of National Defense as certain to have an adverse effect upon the national defense program. Points stressed in the memorandum are: (1) The coal and coke industries are essential to the national defense; (2) these industries are immediately threatened by proposed construction of natural-gas facilities; (3) construction of the proposed pipe lines will require a large tonnage of steel, which is essential to national defense; (4) operation of such pipe lines will result in curtailment of supply of coke, toluol, benzol, xylol, ammonia, tar, naphthalene, etc.—essential to national defense.

Signatories to the memorandum include: Anthracite Institute, Byproduct Coke Producers' Institute, Byproduct Coke and Gas Producers (six Midwest plants), Coal Merchants' Association, Inc.; Fuel Merchants, Inc.; Maher Coal Bureau, National Coal Association, New York State Retail Solid Fuel Merchants' Association, Inc.; Pennsylvania Retail Coal Merchants' Association, Progressive Miners, Retail Solid Fuel Industry of New York City, United Mine Workers and Wisconsin Coal Bureau, Inc.

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## T. C. I. Orders 73 Coke Ovens

The Tennessee Coal, Iron & Railroad Co. awarded a contract on Dec. 14 to the Koppers Co. for construction of 73 byproduct coke ovens at its Fairfield (Ala.) works. This will add about 400,000 tons annually to the company's coke production at Fairfield, bringing the total ovens to 436 and total output to 2,330,000 tons.

# Characteristics of A.C. and D.C. Motors Engross Illinois Electrical Group

THE Southern Illinois Mining Electric Group met at West Frankfort on Dec. 6, with T. J. Carter, engineer for the Allis-Chalmers Mfg. Co., Norwood, Ohio, as the principal speaker. For the reason that load peculiarities differ greatly, said Mr. Carter, both a.c. and d.c. motors having various characteristics are built. D.c. motors, he pointed out, are made with shunt, compound and series fields, and for maintaining a stable commutating point and for certain heavy and reversing applications, commutating fields, compensating windings and cross connections are added. Such special motors are used for mine haulage and for operating electric shovels in strip mining.

Advantages of d.c. motors listed by Mr. Carter are: (1) smooth acceleration; (2) convenient speed change; (3) cheaper controls; (4) control possibilities.

The speaker then took up consideration of speed torque curves of three-phase squirrel-cage induction motors, the curves illustrating the wide range of motor characteristics available as N.E.M.A. standard ratings. Many mining men, said Mr. Carter, do not know that these all spring from a standard stator and that the variation is all in the construction of the rotors, which are interchangeable. By noting the intersection of the curves with the 100-per-cent load line, the slip of any given type of induction motor may be obtained. The exact shape and value of these curves vary with the size and speed of individual motors. The curves shown in the accompanying illustration are for a 50-hp. motor.

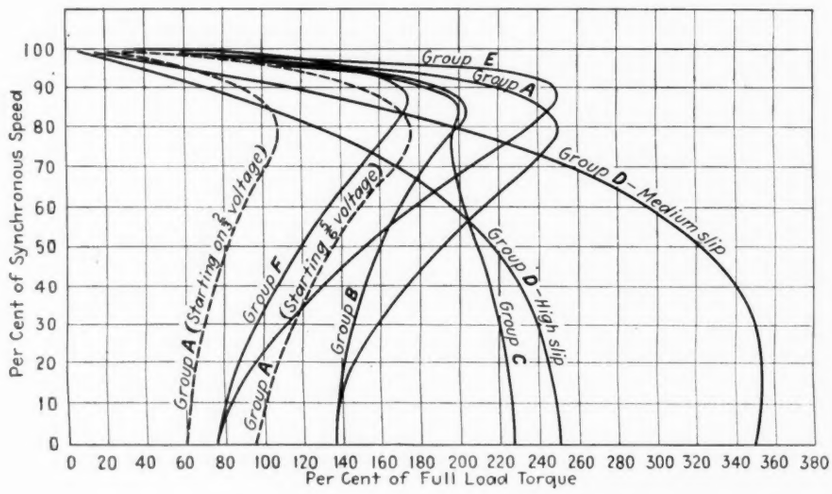
Two-speed motors are made possible by regrouping windings in the slots, and three- and four-speed motors by the addition of a second winding in the slots. These are definite speeds, the regrouping usually being made with a drum switch. Variable-speed induction motors are commonly of the wound-rotor type with an external resistor. The wound rotor has the advantage of high starting torque with low current.

The well-known fact that torque of induction motors varies as the square of the applied voltage, the speaker emphasized, is illustrated by the two dotted curves which show the effect of reducing voltage to five-sixths and two-thirds of normal value. This is one of the arguments for using across-the-line start motors, as they avoid compensator losses. Such motors are now made in quite large sizes, said Mr. Carter, and are applicable anywhere power companies will accept them.

Synchronous motors have the characteristics of definite fixed speed and ability to improve poor power factor by overexcitation of the rotating field. Design has been so improved that modern machines come right on up to full speed; there is no danger of being caught with half-speed troubles. One question that many electricians have wondered about was cleared up by the speaker: The pull on an induction motor is exerted on the rotor windings; the pull on a synchronous motor, on the rotor pole pieces —the iron. It is possible to make a synchronous motor out of a squirrel-cage motor by sawing sections out of the rotor so as to leave a pole effect in its form.

Commenting on motor troubles, Mr. Carter voiced the belief that discussion of them is of as much value to the user as is one on design. We listed these important causes of difficulties: Dirt is the greatest enemy of motors; grit, dirt and oil supply are responsible for most bearing troubles, the last named through leaks from loose housing bolts in split bearings (the best oil seal for split bearings being glyptol); oil becoming churned into a mist and being lost; and shaft seals getting damaged, causing oil to leak, too much oil being added and excess oil finding its way into the windings and ruining the insulation; and, finally, misalignment.

Interesting points of design also were considered by Mr. Carter. Difficulty in designing double squirrel-cage motors to avoid fatigue of metals due to unequal heating of the two windings, he said, has been remedied. Mechanical failures, he pointed out, have long been known to be the effect of the omission of fillets, but it now seems that ample fillets are equally important in aluminum cast rotors to eliminate eddy currents and consequent local heating. The speaker advocated "fillet



# Fiberglas* Insulation cut losses from downtime on the toughest jobs

LAST YEAR a certain Midwestern steel plant changed over to Fiberglas for electrical insulation.

Result: $24,000 saved on maintenance (according to the company's own figures).

In addition, *they had less downtime* on equipment that worked in moisture...

. . . in scorching heat, dust, flying scale-particles from the rolling mills . . . over pickling baths where corrosive acid fumes surround the motors . . . and on cranes where many stops and starts cause serious overloads.

What's more, the company made that $24,000 saving even though they had *more* equipment running *more* hours than the previous year!

*Wherever* you have tough jobs to do, Fiberglas may well do them better, with fewer headaches, and at less cost.

Perhaps you don't have motors working under tough conditions. Perhaps the surroundings in which your motors work are entirely normal.

### *Then so what?*

Is it possible for Fiberglas-insulated motors to help you?

Yes! *And in a very important way!*

Today, industry is gearing up for defense production. 24-hour schedules are becoming more and more common. And as machinery operates more hours per day and at greater speeds, *the hazard of downtime mounts.*

You need an additional safety factor in your motors. And you can get the maximum safety factor in standard-size Fiberglas-insulated motors.

Also, today important motor manufacturers are making smaller-size Fiberglas-insulated motors which operate safely at approved higher temperatures.

### *And the pay-off?*

Even these smaller motors have a substantially larger safety factor than ordinary motors insulated with class A materials. And their cost is little, if any, more.

So, with the expensive bugaboo of downtime looming larger on the industrial horizon, watch out! In new equipment or in your next repair job, specify complete Fiberglas Electrical Insulation. *Owens-Corning Fiberglas Corporation, Toledo, O. In Canada: Fiberglas Canada, Ltd., Oshawa, Ont.*

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**FIBERGLAS***

*T. M. Reg. U. S. Pat. Off.

## SPECIFY FIBERGLAS ELECTRICAL INSULATION

everything." Replying to a query on the suitability of cast aluminum rotors for mining machinery, he said his company is now building small motors with such rotors. He said he considers them as good as rotors with copper conductors.

Something new in motors, he said, is a Goodman totally inclosed flywheel squirrel-cage motor with a readily replaceable stator. The flywheel is completely inclosed in the motor frame. It is applicable to any drive where stored energy is needed to carry a hard pull in the operating cycle.

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## Colver Rescue Team Honored At Johnstown Banquet

With over 530 members and guests in attendance, the Central Pennsylvania Safety Association held its first annual banquet in the Masonic Temple, Johnstown, Pa., Dec. 7. A feature of the banquet was the presentation of awards to the Colver (Pa.) mine-rescue team of the Ebensburg Coal Co., winners of a recent contest for rescue teams in the region.

With Dennis Keenan, 15th bituminous district inspector, as toastmaster, speakers of the evening were Ross Leffler, chief, safety division, Carnegie-Illinois Steel Co.; Richard Maize, new Secretary of Mines for Pennsylvania, and J. J. Forbes, supervising engineer, safety division, U. S. Bureau of Mines, who presented the prizes to the Colver team. Mr. Keenan was introduced by R. D. Joseph, 6th bituminous district inspector and chairman of the association. Other association officers are: W. C. Fancourt, general manager, Bird Coal Co., vice-chairman; C. P. Brinton, chief engineer, Barnes & Tucker Co., secretary; and Bart C. Leonard, Adams Fuel Corporation, treasurer.

Sportsmanship, meaning playing the game accoring to the rules and looking out for the other fellow's interests, was the theme of Mr. Leffler's address. The safe man, he contended, does nothing that would result in an injury to a fellow worker—and, more than that, takes positive steps to insure his protection. With national defense now of paramount importance, safety becomes even more vital, not only in mines and industrial plants but on the streets and in the home.

Richard Maize, new secretary of Mines for Pennsylvania, addresses the meeting. At his right is Dennis Keenan, chairman of the banquet committee, and at his left Ross Leffler and J. J. Forbes.

Colver rescue team with company and State officials.

Kneeling in the front row, left to right, are team members Michael K. Cooke, William Smith, Martin Wallet, John Mrugala, Walter Angert and Robert Campbell. In the rear, left to right, are Morgan Watkins, safety director; T. L. Aitken, superintendent; W. G. Thomas, chief engineer, and D. J. Sullivan, foreman, Ebensburg Coal Co.; Dennis Keenan, 15th bituminous district inspector; and Richard Maize, Pennsylvania Secretary of Mines.

## Tipple Contract Awarded By Emerald Company

Emerald Coal & Coke Co., operated by the Hillman interests, has awarded a contract to the Dravo Corporation for part of the foundation work for a proposed river and rail tipple at its mine on the Monongahela River and Monongahela Ry. at Clarksville, Pa., and for one ice breaker.

The contract for the tipple has been let to the Morrow Manufacturing Co. Grading for railroad tracks and construction of foundations for the rail tipple are being done by the Donora Construction Co. An airshaft is being sunk by the R. G. Johnson Co.

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## New Institute Organized

A new group, known as the Wyoming-Pocahontas Coal Mining Institute, has been organized at Mullens, W. Va. These officers were named: President, James B. Benson, Raleigh-Wyoming Mining Co.; vice-presidents, W. L. Johnson, Raleigh-Wyoming Mining Co.; W. F. Cook; C. R. Bourland, Koppers Coal Co.; T. R. Blankenship, Gaston Coal Co., and Earl McCoy, Buckeye Coal & Coke Co.; secretary, Floyd H. Houck.

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## New Preparation Facilities

Clinchfield Coal Corporation, Mine 52, Dante, Va.: Contract closed with Fairmont Machinery Co. for crushing and recirculating equipment; capacity, 175 tons per hour crushed to 2½ in.; to be in operation about Jan. 15.

Consolidation Coal Co., Mine 120, Acosta, Pa.: Contract closed with Fairmont Machinery Co. for secondary crushing equipment; capacity, 100 tons per hour crushed to ¾ in.

Consolidation Coal Co., Mine 123, Gray, Pa.: Contract closed with Fairmont Machinery Co. for secondary crushing equipment; capacity, 50 tons per hour crushed to ¾ in.

Consolidation Coal Co., Mine 32, Shinnston, W. Va.: Contract closed with Fairmont Machinery Co. for added equipment to existing tipple and a washing plant; r.o.m. capacity based on 450 t.p.h.; coal to be washed is 5x⅜ in., approximately 350 t.p.h.; washing unit a 13-ft. 6-in. Chance cone; plant has two-stage crushing with facilities for remixing and handling of house coal and includes stoker-coal screening and blending facilities for slack and stoker size; boom loading for all five tracks; to be in operation about April 1.

Harry E. Coal Co., Swoyersville, Pa.: Contract closed with Koppers-Rheolaveur Co. for three 12-ft. and one 10-ft. Koppers Menzies cone separators to be installed in new cleaning plant now being built; one 12-ft. separator will be used to clean egg and stove, another to clean nut, and the third to clean pea and buckwheat; the 10-ft. unit will clean rice and barley; the four separators will have a total cleaning capacity of 590 tons of coal per hour.

Necho Coal Co., Donaldson Breaker, Donaldson, Pa.: Contract closed with Deister Machine Co. for five latest type No. 16 Deister Plat-O coal-washing tables

MY ADVICE IS...
USE EXCELLAY!
FROM THE DAILY REPORT OF A TIGER BRAND WIRE ROPE ENGINEER
I was just walking into Mr. Brown's office when one of his engineers called this morning.
"My advice to you," he said on the phone, "is use Excellay. No other rope can touch it. Next time the Tiger Brand Engineer comes in I'll have him see you. He's helped me out dozens of times."
Then he looked up and saw me "Well," he said, "speak of the devil and there he is." The three of us went over the specifications together, and decided that Brown was right -- Excellay will do the best all-round job.
Yours,
Jim

KNOWING wire rope from A to Z—how to choose it and how to use it—that's the job of the American Tiger Brand Wire Rope Engineers. It will pay you to make use of their specialized knowledge and experience, gained through years of practical service to wire rope users in every industry, everywhere.

These men do more than help you select the right rope for a given application. If for any reason you are not getting full performance, they can help you locate the trouble and suggest practical ways and means for eliminating the difficulty. Get to know the American Tiger Brand Wire Rope Engineer who contacts you. Discuss your wire rope problems with him. Get his advice on every wire rope specification.

He can help you get a full dollar's worth of performance out of every dollar you invest in wire rope.

USS
EXCELLAY
*Preformed*
WIRE ROPE

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
*For Anthracite Service:* Miners Bank Building, Wilkes-Barre, Pa.
COLUMBIA STEEL COMPANY
San Francisco
United States Steel Export Company, New York
UNITED STATES STEEL

to treat pea, buckwheat, rice, barley and No. 4 buckwheat sizes of anthracite; capacity will vary according to available quantity of each size but will run from 60 to 75 tons per hour.

West Virginia Coal & Coke Corporation, No. 5 Mine, Omar, W. Va.: Contract closed with Jeffrey Mfg. Co. for washing, crushing and screening equipment including Jeffrey diaphragm jig, dewatering screens, Jeffrey Flextooth crusher, recovery tank and conveyor and scraper conveyors; raw feed, 3x1¼ in. at rate of 108 tons per hour; extension to present plant; approximate date of completion, May 15.

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## Obituary

W. A. Richards, 44, well-known coal operator of Bluefield, W. Va., was found dead Dec. 7 in his home there. He died of a bullet wound which local authorities pronounced self-inflicted. At the time of his death he was president of three operating companies: Majestic Collieries Co., Pike County, Kentucky; Ashland Coal & Coke Co., McDowell County, West Virginia, and Pemberton Coal & Coke Co., Raleigh County, West Virginia. He also headed the sales organization, Sovereign Pocahontas Co., which has offices in fourteen cities throughout the eastern half of the United States. He was a former president of the Winding Gulf Operators' Association. A native of Wilkes-Barre, Pa., he had gone to West Virginia in 1924 to serve as general manager of the three operating companies. The day before he was found dead he had returned from a New York clinic where he had undergone a physical examination.

W. J. Wolf, 56, general manager of operations, Consolidation Coal Co., died Nov. 25 at Fairmont, W. Va. He joined the company in 1915, when he was appointed a mine superintendent.

Walter W. Gilbreath, 51, former State mine inspector in Tennessee under the administration of Governor Peay, who also served as superintendent of the State mines at Patros, Tenn., and who for years was superintendent of Tennessee Products Corporation mines at Bon Air, Tenn., died Nov. 22 at his home in Jasper, Tenn. At one time he had been affiliated with the Tennessee Consolidated Coal Co.

John J. Thomas, 80, formerly mine superintendent for the Carterville & Big Muddy Coal Co., died at his home in Cambria, Ill., late in November. He came to this country from Wales in his early years, settling first in Pennsylvania.

B. F. Argust, 84, father of the late W. C. Argust, district superintendent for the Peabody Coal Co., Taylorville, Ill., was buried Nov. 24. He was one of those who refused to quit; he was gatekeeper at Langley No. 9 mine until about two years ago.

Charles Plummer Hill, 79, prominent Alberta (Can.) and Idaho coal-mining and railroad man, died suddenly of a heart attack Nov. 29 in Pasedena, Calif. A native of Delaware, Mr. Hill went to Canada in 1901 and became a nationalized citizen three years later. He began his career as a mechanic and at first worked for some well-known United States railroad before entering the mining field. He established the towns of Port Hill, in Idaho, and Hillcrest, Alberta. He was the founder of the Hillcrest Collieries and the Hillcrest Coal & Coke Co. in Alberta. The Kitchener Iron Range, afterward owned by the Canadian Pacific Ry. and himself, was discovered by Mr. Hill.

Sir David Richard Llewellyn, 61, chairman of the Welsh Associated Collieries, died Dec. 15 at Aberdare, Glamorganshire. He headed a combination of coal mines and steel mills completed in 1919. The group had a capital of $30,000,000 and controlled an output of five million tons of coal annually.

•

### Explosion in Ohio Coal Mine Takes Toll of 31 Lives

Thirty-one lives are believed to have been lost in an explosion Nov. 29 in the Nelms mine of the Ohio & Pennsylvania Coal Co., near Cadiz, Ohio. The blast occurred in Sec. 4, off Sec. 12, more than a mile from the nearest exit shaft. Rescue work was hampered by rock falls. Company officials declined to comment on the cause of the explosion pending a thorough investigation. Latest reports stated that 27 bodies had been recovered.

In connection with the opinion of John Owens, Ohio district United Mine Workers president, that the disaster was due to an explosion of gas, it was pointed out that the region is dotted with gas and oil deposits. State Industrial Commission officials on the scene said the mine used approved equipment and practiced rock-dusting.

### N. C. A. Official Again Assails St. Lawrence Project

Renewing his attack on the St. Lawrence hydro-electric project, John D. Battle, executive secretary of the National Coal Association, on Dec. 8, issued the following statement:

"President Roosevelt in his latest statement in advocacy of the St. Lawrence project affirms that 'a new source of cheap power for national defense must be developed immediately.' Surely there can be no need for devising *new sources* of power so long as the nation's premier power medium and greatest natural resource—bituminous coal—remains close at hand in virtually inexhaustible supply.

"There can be no disputing the fundamental proposition that the cheapest and most immediate way to provide additional electric power, if needed for national defense, is to construct additional coal-burning steam plants. The producers of bituminous coal reiterate their assurances to the President and to the country of their willingness and readiness to cooperate in all such undertakings.

"There can be no escape from the self-evident truth that the only way that the St. Lawrence hydro project and seaway can be brought into being with any degree of immediacy—that is to say, within five or six years—is by diverting to its construction men and materials in huge amount—now needed in present shipbuilding, present aircraft construction, present munitions plant and other things in these categories. It means sacrificing immediate and super urgent construction in order to embark

*Wide World*

View at topworks of Nelms mine of the Ohio & Pennsylvania Coal Co., where an explosion on Nov. 29 entombed 31 miners.

upon a long-range project which is by no means so feasible and so advantageous as is now made to appear."

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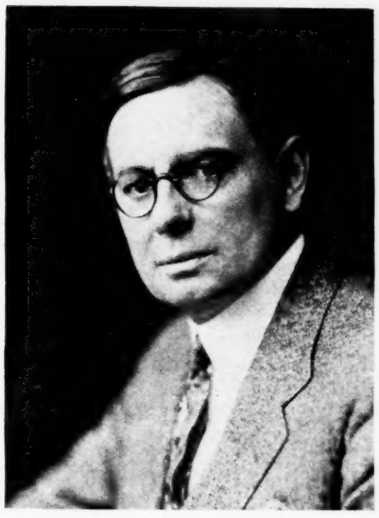
### John C. Wilson Is Dead: Long With Ohio Brass

John Cliffe Wilson, manager of the mining sales department, a director of the Ohio Brass Co., and nationally known in the coal industry, died at Mansfield (Ohio) general Hospital Dec. 18 after an illness of several days. He had been in ill health for some time but had been at his office until a few days preceding his demise. He had been



John C. Wilson

identified with Ohio Brass for the last 35 years, having begun in the production department. Later he was made assistant office manager and in 1912 became head of the mining sales department. In 1923 he was one of the organizers of the Manufacturers' Division of the American Mining Congress and served as chairman of the board of governors on numerous occasions since.

•

### Permissible Plate Issued

One approval of permissible equipment was issued by the U. S. Bureau of Mines in November: Joy Mfg. Co., Type BU-3P loading machine; four 7½-hp. and one 4-hp. motor, 500 volts, d.c.; Approval 413-A, Nov. 12.

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### Dearth Coke Plant Leased

The Dearth coke plant, in the Connellsville (Pa.) district, inactive for many months, has been leased from the H. C. Frick Coke Co. by Frank Crow Jr. and Lawrence Parshall, both of Uniontown, in cooperation with the Wieman & Ward Co., Pittsburgh. Ovens are now being rehabilitated and the plant is being made ready for operation, according to C. S. B. Ward, president of the Wieman & Ward Co., which will act as sales agent. The initial output of the Dearth plant has been contracted for national defense needs. When fully mod-


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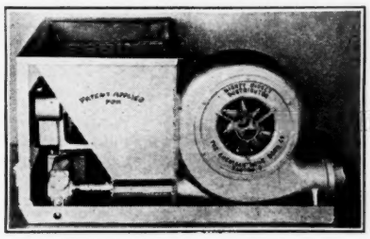

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ernized the property will have an annual capacity of 200,000 tons of low-phosphorous low-sulphur beehive coke, according to Mr. Ward.

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### Blames Federal Mine Bill Foes For Sonman Blast

Fines of $100 each were imposed by Judge Charles C. Greer, in court at Johnstown, Pa., on Dec. 3 on the mine superintendent, mine foreman, and assistant mine foreman in connection with the Sonman Slope mine disaster of July 15, in which 63 lives were lost. In passing sentence the Judge said the mine officials were lax in inspecting safety measures and characterized the State mining laws as not sufficiently strict. He urged that inspection of mines be turned over to the federal government, as provided for in the Neely mine safety bill.

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### Offer Stoker Course at M. I. T.

A comprehensive course in domestic stoker engineering is to be offered by the Massachusetts Department of Education, Division of University Extension, according to an announcement by John P. McGrail, supervisor of education. The course will start Jan. 16 and continue each Thursday night for eight weeks. The class will meet at the Massachusetts Institute of Technology, Boston. The course will be conducted by Allen H. Bearse, Jr., of Waltham, New England manager of Anthracite Industries, Inc., who has handled stoker lectures for his organization in its own schools.

Subjects to be covered in the course include: types of stokers; draft requirements; application of stokers for conversion work; stoker sizing; stoker installation; baffles, and service.

The university extension division announces that a subsequent course will be offered if there be a demand for it, covering advanced stoker engineering, commercial stokers, special stoker applications such as cooking, water heating, and industrial or power heating.

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## Industrial Notes

JOHN A. ROEBLING'S SONS CO., Trenton, N. J., has appointed W. K. Hanna as manager of its Pittsburgh territory, which also includes certain areas in Maryland, Virginia, West Virginia and Kentucky. He has been associated with the company since 1919. Horace E. Thorn has been made manager of the Philadelphia branch office. He joined the company shortly after graduation from Drexel Institute in 1912.

GENERAL ELECTRIC CO., Schenectady, N. Y., has named as vice-presidents Dr. W. D. Coolidge and Stuart M. Crocker. Dr. Coolidge will continue as director of the company's research laboratory, of which he has been a staff member since 1905. Mr. Crocker, who joined the company in 1921 as assistant to Owen D. Young, then chairman of the board, has been manager of the air conditioning and commercial refrigeration department and a vice-president of the International General Electric Co. Forman H. Craton has been appointed section head of the industrial haulage section of the company's transportation department at Erie, Pa.

AMERICAN CAR & FOUNDRY CO., New York City, has named Jay M. Reibel as advertising manager. He was formerly with McCann-Erickson.

CATERPILLAR TRACTOR CO., Peoria, Ill., has appointed Donald A. Robison a vice-president and Gail E. Spain has been advanced to the post of general sales manager. Mr. Robison will have administrative direction of all selling and advertising activities. Mr. Spain succeeds to Mr. Robison's old post.

COPPERWELD STEEL CO., Warren, Ohio, has made Paul Keller Cleveland district manager in charge of Aristoloy alloy steels. Mr. Keller formerly was with the Mid-States Steel & Wire Co. and the Bethlehem Steel Co.

DUFF-NORTON MFG. CO., Chicago, manufacturer of lifting apparatus, has appointed Alex S. Anderson as district manager for Midwestern territory with headquarters at the company's main office.

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## New Approaches to Coveted Objectives Enliven Sessions of Coal Mining Institute

HOW TO PREPARE men for mechanical-mining and mine-rescue work, how steps can be saved, work speeded and labor made easy, how the growing hazards from coal dust, oil and gas wells and abandoned mines can be met and how inspectors can be helpful in other ways than by making inspections kept the 44th annual meeting of the Coal Mining Institute of America at Pittsburgh, Pa., Dec. 12 and 13, active with never a dull moment. Because of the illness of President N. G. Alford, E. A. Siemon, the first vice-president, presided.

Mechanized mining, asserted D. C. Jones, supervisor, coal mining extension, Pennsylvania State College, is making a demand for more trained men in the coal industry. Possibly, seven or more times as many maintenance men are needed with machine loading as with hand loading. Bosses should have more than a passing knowledge of the equipment in use, for on them rests responsibility for deciding whether a "lame" machine shall be continued in service or its operation stopped before serious damage results.

#### Quick Training Impossible

Men who have never attended school after the fifth or sixth grade, he declared, cannot be turned into high-grade mechanics by a specialized priming course of only five or six months' duration. Nor can good results be obtained from a training program into which the men have beeen forced by company pressure. Moreover, favoritism in selecting the man to take the training course is likely to bring unfavorable criticism from those not so favored.

In 1939, the Rochester & Pittsburgh Coal Co. decided to mechanize partially three mines near Indiana, Pa. In two years about $2,000,000 was spent on equipment. One section of one mine was found suitable for mobile loading machines and the rest of the operations for conveyors. A training program for men to operate such mechanical mining was put in effect in September, 1939. Men were invited to enroll from all the mines of the company; 348 accepted. Tests were made to determine their mental alertness, mechanical aptitude and emotional stability.

After the classes had been in operation for several months, 106 additional men were enrolled. To Course 1, 320 men were admitted, but 134 lost interest or were of such poor caliber that training of the type contemplated would be wasted effort. Slightly more than 67 per cent, or 215 men, completed Course 1, which was taught by a member of the college extension force.

Meetings were held in the communities where the mines are located, men and bosses being in the same classes and sessions being held mornings and evenings so as to enable all men to attend. Sessions lasted two hours—lecture or demonstration—and assignments were given for work between sessions. This basic training course, covering arithmetic, elementary mechanics, strength of materials and electricity, lasted ten weeks.

Course 2 was given to the best 45 men, preference being shown to men who had already been employed in maintenance work or had indicated a liking for this work and had qualities desirable in a maintenance man. The meetings were held in Indiana with the instructor a member of the mineral industries extension division of Pennsylvania State College.

Training covered chain, belt and shaker conveyors; motors and power units for conveyors; cutting machines and drills; control circuits and power lines in a conveyor system; mobile loading units, and mining law. Course 2 was completed by 41, but only 35 deserved credit.

However, all 41 were invited to attend Course 3 and, with another enrolee (a master mechanic), 38 took the course, which laid emphasis on electricity and "shooting trouble"; 34 received credit. Course 3 which was concluded in May 1940, covered starting, commutation and troubles of mine motors; contactor-type starters; fuses, and safe practices.

Classes were discontinued until September, after which the work was split up among company men, two division maintenance superintendents, two mine electricians and an assistant mine electrician, under supervision of the staff member who taught Courses 2 and 3. About 190 men enrolled, with 51 men in the mobile loading group and 20 to 44 in each of the four conveyor loading groups.

Within two or three months, mine superintendents discovered that breakdowns were less frequent and less serious and each unit of equipment consistently produced more coal. Employment of company employees as instructors, with preference for maintenance supervisors, is favored because they personally receive valuable training in the per-

formance of these duties and are able to spot outstanding students who may merit additional training for specific jobs.

"The scrap heaps at our mines," voiced G. R. Spindler, assistant director, mining extension department, West Virginia University, "have been filled with the carcasses of machines of a score or more years ago. Many of our early failures in the use of such equipment had their origin in our regarding the **problem as one of machinery** rather than of men or a combination of the two . . . Mechanical improvemeents . . . develop faster than the skills and capacities of the operating personnel."

University extension tries to teach: (1) supervisory personnel and (2) repair and maintenance men with some overlap between the two. The training must be regarded as a continuing project. Specific job training may suffice for the working crew but not for the supervisory personnel or for those who install, repair and maintain equipment.

"Reason rather than memory," emphasized Dr. Spindler, "is the keynote of proper training"; technical principles should govern rather than standards. Principles are alike for hand mining and mechanized mining, but with the latter speed is increased, and delays are more disastrous. Hence, the same instruction is needed for both with some additional material for mechanical-loading employees. What is needed is a thorough understanding of what constitutes good mining practice under any method of extraction. Specific to mechanization are: (1) foremanship, (a) industrial relationships, (b) employer-employee contacts, (c) personnel analysis and selection, (d) job responsibilities; (2) mechanical mining systems and methods with analysis of results obtained; (3) production analysis, (a) crew organization, (b) operating cycles, (c) time studies, (d) cost analysis; (4) mining electricity, (a) general principles, (b) power transmission and transmission systems, (c) care and operation of equipment; (5) mathematics, (6) mechanics. No mere academic view is taken. Our training is definitely vocational, as outlined by practical mining men.

### Training in Mine Shop

"For mining maintenance men, we have had for years somewhat intensive courses on principles of electricity, power and power losses, operating characteristics of electrical equipment, wiring diagrams and their use, mathematics and mechanics. More recently, in cooperation with mining companies more specific shop training has been offered, using shop space, facilities provided by the companies themselves and a wide range of equipment. Preventive as well as repair maintenance is taught, and matters stressed are safety, knowledge of equipment, selection and care of tools, inspection policies, cleanliness, orderliness, importance of standard parts, quality workmanship and cooperation with other workmen and departments.

"Maintenance classes meet weekly for four-hour periods during about fourteen weeks, but so far we do not have all the answers; yet the work has been recognized as definitely successful. This year 2,100 men are enrolled in classes at about 60 points scattered among various coal-mining areas in the State."

"Our high school has a class in which mechanics is studied," added T. F. McCarthy, general superintendent, Clearfield Bituminous Coal Corporation, "which we hope to broaden later to cover electricity. We have to look to the young men, for only they have the basal education on which to found the more elaborate technique." The permissibility features in permissible machines, added L. C. Ilsley, supervising engineer, electrical and mechanical section, U. S. Bureau of Mines, are useless unless men are available to keep them in shape.

There is no time in a mine to train men, regretted W. P. Vance, general superintendent, Butler Consolidated Coal Co.; only in a class can time and opportunity be available for training. It is astounding how little these men often know. Have the men find out the causes of outages and let them correct them, asserted F. R. Vinton, personnel manager, Rochester & Pittsburgh Coal Co. They then will be really learning something.

Motion studies, declared Gray Linsley, industrial engineer, Pittsburgh Coal Co., have greatly speeded production, reducing supervision 40 per cent and decreasing crews by three men. After time studies have been made, production standards can be established. Close studies can be made of any part of the operation the performance of which is the bottleneck of the cycle, be it slating, posting, moving, cleaning, cutting, drilling or loading. Men can be shifted from one type of work to another so as to make the several elements of a lagging cycle click. Time studies train engineers and improve their powers of observation. The Pittsburgh Coal Co. has twelve men making time studies, and there is a big demand from superintendents for their services.

Job simplification is a proper title for motion study, said H. B. Maynard, president, Methods Engineering Council, Pittsburgh, Pa. Production is increased not by speeding the motions of the worker but by easing the work by such means as reducing steps and muscular efforts. One must get step conscious. "I have been thinking," asserted Frank Dunbar, general manager, Pickands, Mather & Co., "how the shotfirer's work might be simplified by placing the explosives and the dummies more conveniently for the shotfirer and similarly locating the shooting cable so as to reduce his labor."

### Low-Volatile Coal Explosive

If the source of ignition is violent, dust of low-volatile coal virtually is as explosive as that from many high-volatile coals, warned C. W. Owings, mining engineer, safety division, U. S. Bureau of Mines, adding that its explosibility is greatly increased when gas initiates the explosion. All coal mines except those for the mining of anthracite should maintain their dust at 65 per cent incombustible content with 1 per cent extra for every 0.1 per cent of methane in the air.

Boreholes in mines which were regarded as non-gassy have been found by the Bureau to contain 19 per cent of methane. When the rate of advance is increased in gassy mines, hazard increases greatly. Most mechanized systems have augumented the quantity of coal dust. To save time, machine cuttings are not loaded before shooting and, even where they are, all the high-sulphur or high-ash coal is thrown in the gob.

Hand loading onto a conveyor makes less dust than hand loading into cars. Mobile units (Joy, Jeffrey and Whaley) raise more dust than hand loading on conveyors, with the last of the cut and machine cuttings proving to be the dustiest material handled.

Rib dust in rubber-tired-transportation sections average 27 per cent through 200-mesh and road dust 28 per cent, and weight of dust averages 21 and 81 grams per square foot. On the other hand, in the section with truck equipment, dust through 200-mesh was 22 and 17 per cent in rib and road dust respectively and in like manner weight of dust averages 9 and 41 grams per square foot. Hence, where shuttle cars are used, percentage of minus 200-mesh dust is 1¼ times as great and weight per cubic foot 2½ times as great as where track haulage is used. About 1⅞ as much coal dust passed 200-mesh, and total weight was twice as great.

When water is applied to the cutter bar by a water pipe placed through the center of the bar terminating at its end, unless the pressure is high enough and sufficient water is used, cutting under specific conditions may raise more dust than dry cutting. Thus,

## Coal Mining Institute of America Roster, 1940

President, E. A. Siemon, district general superintendent, Hillman Coal & Coke Co., California, Pa.; first vice-president, J. J. Forbes, supervising engineer, Safety Division, U. S. Bureau of Mines, Pittsburgh, Pa.; second vice-president, F. W. Howarth, district mine inspector, Pennsylvania Department of Mines, Republic, Pa.; third vice-president, W. P. Vance, general superintendent, Butler Consolidated Coal Co., Wildwood, Pa.; secretary-treasurer, G. W. Grove, mining engineer, Safety Division, U. S. Bureau of Mines, Pittsburgh, Pa.

Managing Directors—Two years: N. G. Alford, mining engineer, Eavenson, Alford & Auchmuty, Pittsburgh, Pa.; M. L. Coulter, chief engineer, Clearfield Bituminous Coal Corporation, Indiana, Pa.; C. M. Donaghue, assistant manager, mining department, Mine Safety Appliances Co., Pittsburgh, Pa.; E. A. Holbrook, dean, School of Engineering, University of Pittsburgh, Pittsburgh, Pa.; J. L. Hamilton, assistant manager, Republic Steel Corporation, Uniontown, Pa.

Managing Directors—One year: F. E. Bedale, assistant to the general manager, Consolidation Coal Co., Fairmont, W. Va.; J. M. Conner, manager of mines, West Penn Power Co., Pittsburgh, Pa.; C. H. Dodge, safety engineer, Buckeye Coal Co., Nemacolin, Pa.; J. V. McKenna, district mine inspector, Pennsylvania Department of Mines, Waynesburg, Pa.; G. J. Steinheiser, district mine inspector, Pennsylvania Department of Mines, Indiana, Pa.

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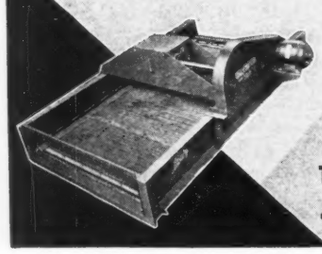

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the dust concentration during wet cutting was 13,000,000 and without water 8,000,000 particles per cubic foot. At another mine the readings were 218,000,000 and 192,000,000 particles respectively.

With a series of nine ⅜-in. holes, 3 in. apart, placed on the outcoming-bit side, so that the dust is wetted well as it travels out of the kerf, 6,000,000 and 68,000,000 particles of dust per cubic foot of air were made in wet and dry cutting respectively. With water on intaking bits, 93,000,000 particles per cubic foot were obtained, with dry cutting giving 247,000,000, a reduction of about 62 per cent. But still there was too much dust.

### More Dust for Shorter Time

Sharp bits make 1½ times as much dustiness as dull bits, but the longer time required to complete the cut with dull bits indicates that eventually twice as much dust is produced. Sumping is an extremely dusty operation.

Hand drilling of coal produces an average of 35,000,000 particles per cubic foot. In cases, concentration may be two or three times as great. In about a dozen mines, electric drilling produced an average of 105,000,000 particles, but the time of drilling ranged from 5 minutes for hand drilling to 1 minute for electric drilling, hence dust in electric drilling is not relatively great and, if a stream of water were played into the collar of the hole during drilling, practically all of the dust would be kept out of the air. In one mine, drilling with pneumatic hammers in shale raised 866,000,000 particles per cubic foot and 1,135,000,000 in another. In the same mine where the bottom rock was drilled with electric drills, the density of dust was only 4,400,000 particles per cubic foot.

Hand loading 2-ft. 10-in. blasted coal into shaking conveyors when wet-cut gave an

### Dust Particles in Various Kinds of Mine Work

| | Particles Per Cu. Ft. of Air |
|---|---|
| Hand loading on conveyor, 28- to 30-in. coal | 50,900,000 |
| Hand loading on conveyor, 28- to 30-in. coal—end of cut | 140,000,000 |
| Hand loading on conveyor, 3½- to 4-ft. coal—average | 50,000,000 |
| Same in another mine with coal of same thickness—average | 62,000,000 |
| Undercutting in a 6-ft. seam. | 20,000,000 |
| Topcutting in a 6-ft. seam | 29,900,000 |
| End of sumping undercut, average | 54,000,000 |
| Topcutting, average | 96,000,000 |
| End of undercutting | 63,000,000 |
| End of topcutting | 142,000,000 |
| Shearing | 91,000,000 |
| Blasting | 70,000,000 |
| Average of seven mines in loading mechanically | 70,000,000 (41 to 119 million) |
| Low average mine, in loading mechanically | 22 to 52 million |
| High average mine in loading mechanically | 61 to 185 million |

### Dust Particles in Cutting With and Without Water

| | Million Particles of Dust Per Cu. Ft. | | |
|---|---|---|---|
| Operation | Wet Method | Dry Method | Reduction |
| Undercuting | 47.6 | 167.6 | 71 |
| Topcutting | 374.3 | 594.8 | 37 |

average air-borne dust density of 18,000,000 particles, and 50,000,000 when the coal was cut dry. In each test, dust concentration in air was less than 16,000,000 while loading most of the cut, but, when the back of the cut was reached and the fine coal left by blasting combined with machine cuttings, improperly scraped from the cut, counts increased to 26,000,000 and 47,000,000 where cutting was wet and 77,000,000 and 140,000,000 when dry.

Loading booms often scrape roof or bury their nose in coal when loading, so sprinkling is difficult. Where a coal pile from a room neck was sprinkled before and during loading, the count was 276,000,000 per cubic foot dry and 40,000,000 sprinkled. In another mine it was 139,000,000 and 44,000,000 respectively. However, rooms and headings in the block system are so narrow, men cannot stand beside the mobile loader safely.

### Make Water Wetter

Wetting or dedusting agents have been suggested as a means of reducing quantity of water needed, which water is detrimental to the sale of the coal. Some of these agents are emulsions, others mix intimately with water. Some that work well with textiles do not moisten coal or its impurities readily; others require a temperature higher than the mine usually affords; and others need constant or frequent agitation or they will be precipitated; some are oily or sticky and adhere to parts of loading machines; odors unsuited to the mine make others objectionable and some, merely by contact with their container, lose their wetting characteristics.

With some, the coal will be wetted with 50 to 66⅔ per cent less water if a wetting agent is used. With a wetting agent, dust at the discharge point during a test was cut 70 per cent and the quantity of water 70 per cent. Dust that landed on the collecting impinger during tests was damp and presumably would have settled on the floor. The liquid will work its way to the bottom of a pile, coat the surfaces of particles and remain there longer than water.

Once wetted, it may be rewetted solely by applying water and thus would be useful for wetting piles of gobbed dust. Tests conducted at the Bureau's experimental mine with only one wetting agent showed that the particular agent did not prevent propagation, but no tests were made with rock dust on top of the wetted dust, as would be desirable.

In mobile loading, dust can be better controlled than in hand loading, according to Mr. Dunbar. Hand loaders do not use enough water. With hand loading, the water content is 4 per cent; with mobile loading, 5½ to 6 per cent. With triple shift the main problem is to keep the gas percentage down. More gas has to be handled, so a greater air velocity is needed. As a result more dust is blown into the returns.

"The record of accidents and fatalities in the coal industry is nothing less than reprehensible," declared Dr. R. R. Sayers, Director, U. S. Bureau of Mines, in a banquet address read by J. J. Forbes, supervising engineer, Safety Division of the Bureau, on Dr. Sayers' having to leave due to the demise of his father. During the first eleven months of 1940, more than 1,200 men have lost their lives. As the result of five major disasters, 267 men have died. To equal this black disaster record of 1940, one must go back as far as 1928 and to the years when the Bureau of Mines was founded, declared Dr. Sayers.

Maps of the Pennsylvania bituminous coal regions are being prepared, declared Arthur Neale, by the Pennsylvania Department of Mines on a scale of 1,200 ft. to the inch, using all available sources and showing mines, outcrops, gas and oil wells, and pipe lines. In some localities special tracings show the wells on separate sheets and in other sections gas and oil lines are shown on special tracings. It is hoped that this will be a continuing project. W. E. Fohl, mining engineer, indorsing the map work, said it prevented gas lines being located over mined-coal areas.

Discussing methods for obtaining employee interest in safety work, T. P. Bradley, mine foreman, C. A. Hughes Co., said that the 10th Bituminous District Council, Joseph H. Holmes Safety Association, presented two banners monthly, to the two mines having the largest tonnage per lost-time accident during the previous month, also two certificates of merit to section foremen, assistant foremen or firebosses.

One banner goes to mines producing more than 25,000 tons monthly and the other to smaller mines. The local chapters are kept as "miners' parties," and to maintain that atmosphere, meetings are held in the local union hall. Scrupulous effort is made to avoid any effort to place blame on the miner. The safety director is the chairman, and all the other officers are miners. About 25 per cent of the men attend the chapters, but no attempt is made to drive the men to the meetings.

All apprentice miners, Mr. Bradley recommended, should hold first-aid certificates and all candidates for mine official certification should have both these and mine-rescue certificates. Students in the public schools of coal-mining communities should be addressed by mining men.

The first duty of the inspector is to inspect the mines, but laws in some States provide that inspectors shall promote safety; thus promotion of first-aid training, mine-rescue meets and safety organizations comes within their proper activities, declared Mr. Forbes, who presided over a symposium on this subject.

### Should Promote Good Laws

Effort to promote enactment of laws for protection of workmen against hazards introduced by mechanical mining and multiple shifts, asserted D. J. Keenan, inspector, 15th Bituminous Inspection District, should be made by all inspectors. Introduction of safety classes in all the schools of mining communities with classes in mining in junior and senior high-school curricula and suggestion of further means of safety in mines, particularly the placing of flexible barricading material in each entry of gassy mines or mines likely to catch fire with 110 cu. ft. or more of compressed oxygen for each man employed in the entry were two further inspectors' objectives as visualized by Mr. Keenan.

Inspection forces in West Virginia, said P. J. McGraw, mine inspector, District

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TOOLS

can ease the burden on the men who run your post and machine mounted drills—

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By being *light weight*, they are quicker and less tiresome to handle. Excess weight is a burden where it is handled 100 to 200 times a day.

By being the *rigid, conveyor type*, they drill straight holes without choking and clean them clean without scraping—a complete operation eliminated by COALMASTER tools.

By this *system of clean hole drilling*, the augers are pulled and changed quickly—no fuss and no fighting the equipment to get the work done.

By being *accurately aligned* from thread bar to tool point, COALMASTER tools run smoothly, and give the driller time to relax while the drill does the work. Why throw vibration into your driller and tire him unnecessarily when COALMASTER tools will take it out of the drill?

By the COALMASTER patented *system of staggered tooth bit positioning* the holes are started and drilled quickly and easily. The coal is broken and ripped out—*not* pulverized. To the driller it is just a matter of flipping the switch.

By the ball bearing *safety thread bar socket* your driller spends one dollar for gloves where he formerly spent three—he can't get them caught in this socket when he pulls off the thread bar while it is still turning.

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Send us your folder on COALMASTER Tools for Blast Hole Drilling

Name.....Title.....

Company.....

Location.....

No. 4, West Virginia, are too slim for inspections to be made within the time specified by law, and the irregular working time makes it impossible for the inspector to engage in other activities to any great extent except at expense of inspections.

Education is perhaps more important than law enforcement, urged W. W. Dartnell, superintendent, Hillman Coal & Coke Co. Inspectors should wear safety clothing underground, not abusing their privileges, and they should advocate the avoidance of mine nuisances. Safety plays appealed to H. C. Elkins, supervisor of industrial relations, Republic Steel Corporation, as a worthwhile objective of the State inspector. Inspectors, said Mr. McCarthy, bring us helpful information on the ways in which other companies are promoting safety. They do much to foster vocational education in the schools and also talk to civic groups. They can do much that company officials would be unable to do.

In a symposium on safety rules for shotfirers in mechanically operated mines, J. V. McKenna, State mine inspector, Waynesburg, Pa., declared that in mechanical mining, danger of premature shots increases because of the increased length of electric cables and the greater amperages used. Shotfirers should be prohibited from firing any but the ordinary run of shots for blasting coal or drawslate unless the shot is approved by a foreman. The old question whether a shotfirer might be allowed to carry any light other than an approved safety lamp has been settled amicably, for in many mechanically operated mines the shotfirer carries only a flame safety lamp and his helper an electric cap lamp. A ruling has been issued that a shotfirer may carry also an approved electric safety lamp provided it lights only when a contact switch is held in place.

"Ninety-one per cent of the major disaster fatalities in the bituminous coal mines of the United States during the last 2½ years occurred in highly mechanized mines which produced about a third of the bituminous coal of the country. This seems to indicate that the hand-loading mines (at least for the last several years) have been doing a fairly good job in reducing major mine disasters, whereas the highly mechanized mines are failing to do their share in absolving the good name of coal mining from criticism as to major mine disasters, declared J. L. Hamilton, assistant manager, Republic Steel Corporation, quoting Information Circular 7136 of the U. S. Bureau of Mines.

### No Charging While Loading

Shotfirers, he added, should not be permitted to charge any hole in a place where a loading machine is operating. Holes should not be charged in any place where persons other than the shotfirer helper, if one is employed, are working.

The "smog" atmosphere of a working place after the first shot has been fired decreases the already inadequate visibility afforded by a flame safety lamp. Successive shots enhance this, hence shotfirers should have at least one helper to supply the additional illumination of a cap lamp, according to C. H. Dodge, safety engineer, Buckeye Coal Co. A shotfirer should shout "fire" for the first time when connecting his battery and shout again after at least ten actually counted seconds. Thus, the person endangered would have time to retreat or tell him to delay his shot. With multiple shooting, the shotfirer himself should count the shots and sound the "all clear." His helper's attention may be distracted and he may lose count.

Some State authority, said Mr. McKenna, should have power to compel all gas and oil companies to plug wells. A gas or oil well owner can be compelled to pay damages for failure to plug a well, but that payment may be so remote that the company or owner may not be where it or he can be sued. Moreover, litigation is costly. Two machine runners encountered something unusual. Gas came in and the place was sealed. It soon filled with methane. Sometimes gas comes up on the outside of the casing.

A well was struck in a rib line by a mining machine, related Mr. Dunbar. It was 35 years old and probably had not been plugged. Had a record existed of it he would have left a 100-ft. pillar around it, as is the company rule. About 30 seals were necessary to close in the methane. The hole was cleaned out and lined with 4-in. pipe and provided with a 2-in. vent pipe. Some ashes were found, so some filling had been attempted before the well was abandoned.

### Take Pictures in Safety Work

The Pittsburgh Coal Co., said R. H. Nicholas, chief mine inspector, is making pictures illustrating the causes of accidents at the place of work so as to dramatize these dangers and aid the campaign for prevention. Some of these pictures Mr. Nicholas showed on the silver screen.

Abandoned mines are fired by forest fires, hunters seeking shelter, boys playing in the openings and illicit stills, declared W. P. Powers, State mine inspector, McKeesport, Pa. An abandoned shaft covered with reinforced concrete caused the death of four men. A vent pipe of 4 in. diameter and 7 ft. long placed in the seal drained off the gas from the top of the shaft.

A junk dealer started with acetylene torches to remove some sheet steel that had been left above and adjacent to the shaft. On its removal, a sheet fell, breaking the vent pipe about 18 in. above the seal. The next morning the dealer and six employees, resuming work, were involved in a violent explosion which blew the bodies of four men and sections of the concrete seal and steel rails 300 ft. or more.

Flame had traveled down the vent pipe and exploded in the shaft. The explosion probably was due to an ignition of escaping gas either by the flame of the acetylene torch, by the hot sparks of the burning metal or by a lighted match. Following the explosion, a new reinforced concrete seal was placed over the shaft and two 6-in. vent pipes, 12 ft. high, were placed in the seal. U-pipe was screwed on the ends to prevent boys from filling the opening with rubbish; flame arresters were put in the pipe ends. Methane content had been ascertained to range from 10.7 per cent at 10 ft. to 13.3 per cent 300 ft. below the seal.

The flame arrester may consist of six or more fine copper-wire screens, spaced

¾ in. apart, arranged in a sleeve which can be placed within the outby end of the vent pipe. Mr. Powers pleaded for adequate legislation to protect the public from the hazard of abandoned workings.

In one instance, declared another, a deep shaft was filled with rock. Tracks passed over it. Suddenly the filling dropped 30 ft. when a man was walking across it, and he was severely hurt.

In the absence of B. H. Williams, assistant to the president, Pennsylvania Coal & Coke Corporation, G. R. Brown, his assistant, took charge of the symposium on "best methods to maintain interest in mine-rescue training." In forming mine-rescue squads more men wanted to participate and be trained than could be accommodated. From ten active collieries 40 men under 35 years were taken and were divided into four groups of ten men who were trained by groups each week until all 40 men had received an aggregate of 40 hours' training, a section of one of the collieries being used for the entire training period. In carrying out maneuvers, representatives of the Bureau of Mines, State Department of Mines and company officials, raising the number to 67 men, participated. Observers were checked into the mines to note the work done, which was performed in a two-heading entry about 1,200 ft. long with rock taken in one heading and only coal in the other. This was divided into eight sections, each section representing a specific problem. Inspectors of Bureau of Mines and State Department of Mines accompanied teams on each problem.

Mine rescue men should be paid for taking training, said Frank Erkmann, U. S. Bureau of Mines. Those in the Coeur d'Alenes receive an extra 25 to 50c. per day. Selection of the proper men is essential. First they must want to be rescue men, then they must have the right mental attitude; third, they must be specially equipped mentally, that is, disposed toward mechanical and chemical studies and, lastly, they must have the requisite composure.

No qualification, asserted J. V. Berry, supervisor of safety, compensation and relief, Industrial Collieries Corporation, is more important than physical fitness. Men who apply are preferable, but are not taken unless physically fit.

### Sykesville Station Opened

In 1934, the Buffalo & Susquehanna Coal & Coke Co., at Sykesville; the Rochester & Pittsburgh Coal Co., at Helvetia, and the Northwestern Mining & Exchange Co. at Kramer, Pa., said Clyde Maize, organized a mine-rescue association to practice together. This was known as the Jefferson-Clearfield Mine Rescue Association, with a station at Sykesville.

All twenty men were taken to U. S. Bureau of Mines for training. Every man obtained a certificate. The Kramer team was trained at the central station the first Saturday of every month, the Helvetia team the second Saturday, the Sykesville team the third Saturday, and all together on the fourth Saturday from 8 a.m. until noon.

Individual team meetings were confined to the wearing of the apparatus. Meetings

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This photo shows the incline at Clover Splint Coal Company mine at Closplint, Ky., where the track was recently rejuvenated with 800-6"x8"x7' Osmose-treated oak ties, used to replace other ties which had failed in service prematurely because of decay.

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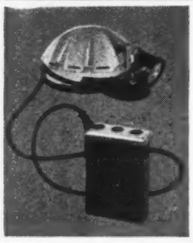

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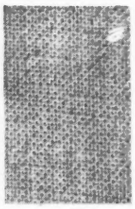

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of the whole discussed mine fires and explosions and how to combat them. Finally, only one meeting was held a month. During the first two hours, one team used the apparatus and the last two hours was devoted to discussions of mine fires and explosions. About every six months the Bureau of Mines sent a man to arrange a problem at one of the mines. The fire apparatus is augmented by apparatus on the Bureau of Mines rescue truck. All members belong to National Mine Rescue Association. The men are paid while training.

•

## Coal-Mine Accident Fatality Rate Shows Further Wane

Accidents at coal mines of the United States caused the deaths of 68 bituminous and 13 anthracite miners in October last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 38,300,000 net tons, the accident death rates among bituminous miners was 1.78 per million tons, compared with 2.37 in October, 1939.

The anthracite fatality rate in October last was 3.07, based on an output of 4,234,000 tons, against 5.48 in the corresponding month a year previous.

For the two industries combined, the accident fatality rate in October last was 1.90, compared with 2.67 in the tenth month of the preceding year.

Fatalities during October last, by causes and States, as well as comparable rates for the first ten months of 1939 and 1940, were:

## Suspension Was Labor Dispute, Says Alabama High Court

A shutdown of coal mines of the Tennessee Coal, Iron & Railroad Co. in 1939 was the result of "a labor dispute," and employees made idle by the shutdown are not entitled to unemployment compensation, the Alabama Supreme Court ruled on Nov. 28. Several days before the expiration of its contract with the United Mine Workers two years ago, the Tennessee company posted a notice that it would shut down its mines for fifteen days, and subsequently it posted other notices along similar lines. Nevertheless the courts held that negotiations regarding a new contract resulted in the shutdown and constituted a labor dispute.

•

## Morgan Dismissal Upheld

Dismissal of Arthur E. Morgan as chairman of the Tennessee Valley Authority in March, 1938, was upheld Dec. 6 by the Sixth U. S. Court of Appeals at Cincinnati, Ohio. Dr. Morgan, who was removed by President Roosevelt, had appealed to federal courts on grounds that he could be removed from the chairmanship only by joint action of both houses of Congress.

In sustaining the ruling of Judge George C. Taylor in the U. S. District Court at Knoxville, Tenn., the Circuit Court likewise rejected Dr. Morgan's claim for back pay he claimed was due him because of the dismissal. Dr. Morgan's suit was filed

UNITED STATES COAL-MINE FATALITIES IN OCTOBER, 1940, BY CAUSES AND STATES

| | Underground | | | | | | | | Opencut and Surface | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Falls of Roof | Haulage | Explosives | Electricity | Machinery | Mine Fires | Other Causes | Total Underground | Shaft | Falls of Persons | Other Causes | Total Surface | Grand Total |
| Alabama | 2 | .. | 1 | .. | .. | .. | .. | 3 | .. | .. | .. | .. | 3 |
| Arkansas | 1 | .. | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 1 |
| Illinois | 2 | 2 | .. | .. | 2 | .. | .. | 6 | .. | .. | .. | .. | 6 |
| Indiana | 1 | 1 | .. | 1 | .. | .. | .. | 3 | .. | .. | .. | .. | 3 |
| Iowa | 1 | .. | .. | .. | .. | .. | .. | 1 | 1 | .. | .. | .. | 2 |
| Kansas | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | 1 | 1 |
| Kentucky | 8 | 6 | .. | .. | .. | .. | .. | 14 | .. | .. | .. | .. | 14 |
| Michigan | .. | .. | .. | .. | .. | .. | .. | .. | .. | 1 | .. | 1 | 1 |
| Missouri | .. | .. | .. | .. | .. | .. | 2 | 2 | .. | .. | .. | .. | 2 |
| Montana | .. | 1 | .. | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 1 |
| Ohio | 1 | 1 | .. | .. | .. | .. | .. | 2 | .. | .. | .. | .. | 2 |
| Pennsylvania (bit) | 4 | 3 | .. | 1 | 1 | .. | .. | 9 | .. | .. | .. | .. | 9 |
| Virginia | 3 | .. | .. | .. | .. | .. | .. | 3 | .. | .. | .. | .. | 3 |
| Washington | .. | .. | 1 | .. | .. | .. | .. | 1 | .. | .. | .. | .. | 1 |
| West Virginia | 11 | 4 | .. | 1 | 1 | .. | 1 | 18 | .. | 1 | .. | 1 | 19 |
| Total (bituminous) | 34 | 18 | 2 | 3 | 4 | .. | 3 | 64 | 1 | 2 | 1 | 3 | 68 |
| Pennsylvania (anthracite) | 9 | 1 | .. | .. | .. | 2 | 1 | 13 | .. | .. | .. | .. | 13 |
| Grand total | 43 | 19 | 2 | 3 | 4 | 2 | 4 | 77 | 1 | 2 | 1 | 3 | 81 |

FATALITIES AND DEATH RATES AT UNITED STATES COAL MINES, BY CAUSES *

January–October, 1939 and 1940

| | Bituminous | | | | Anthracite | | | | Total | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number killed | | Killed per Million Tons | | Number Killed | | Killed per Million Tons | | Number Killed | | Killed per Million Tons | |
| Cause | 1939 | 1940 | 1939 | 1940 | 1939 | 1940 | 1939 | 1940 | 1939 | 1940 | 1939 | 1940 |
| Underground: | | | | | | | | | | | | |
| Falls of roof and coal | 411 | 418 | 1.325 | 1.123 | 104 | 86 | 2.389 | 2.073 | 515 | 504 | 1.456 | 1.218 |
| Haulage | 120 | 156 | .387 | .419 | 24 | 32 | .551 | .771 | 144 | 188 | .407 | .454 |
| Gas or dust explosions: | | | | | | | | | | | | |
| Local | 10 | 12 | .032 | .032 | 3 | 3 | .069 | .072 | 13 | 15 | .037 | .036 |
| Major | 28 | 236 | .090 | .634 | ... | ... | ..... | ..... | 28 | 236 | .079 | .571 |
| Explosives | 12 | 21 | .039 | .056 | 14 | 8 | .321 | .193 | 26 | 29 | .074 | .070 |
| Electricity | 39 | 27 | .126 | .073 | 2 | 5 | .046 | .121 | 41 | 32 | .116 | .077 |
| Machinery | 29 | 23 | .094 | .062 | 1 | 2 | .023 | .048 | 30 | 25 | .085 | .061 |
| Shaft | 4 | 5 | .013 | .013 | 5 | 3 | .115 | .072 | 9 | 8 | .025 | .019 |
| Miscellaneous | 14 | 24 | .045 | .065 | 11 | 6 | .253 | .145 | 25 | 30 | .071 | .073 |
| Stripping or opencut | 7 | 9 | .023 | .024 | 6 | 2 | .137 | .048 | 13 | 11 | .037 | .026 |
| Surface | 28 | 36 | .090 | .096 | 13 | 6 | .299 | .145 | 41 | 42 | .116 | .102 |
| Grand total | 702 | 967 | 2.264 | 2.597 | 183 | 153 | 4.203 | 3.688 | 885 | 1,120 | 2.503 | 2.707 |

* All figures subject to revision.

against the T.V.A. and Harcourt A. Morgan and David E. Lilienthal, who were on the T.V.A. board with him.

•

### 79 Receive Mining Certificates

Seventy-nine men who had completed their examinations in practical coal mining were awarded certificates at a banquet held Nov. 30 at Norton, Va. The course of training was furnished by the Virginia State Department of Education.

The banquet was given by the Virginia Coal Operators' Association, and the principal address was delivered by J. L. Camblos, counsel for the Stonega Coke & Coal Co. Certificates were presented by Dr. B. H. Van Oot, State Supervisor of Trade and Industrial Education. Preceding the presentation of certificates there was an exhibition of mining apparatus by the U. S. Bureau of Mines.

•

## Trade Literature

ARC WELDING—Air Reduction Sales Co., New York City. Electrode Selector Chart enumerates under separate guides, listed according to the metal to be welded, such things as the suggested type of electrode, welding procedure and recommended voltage and current values.

ARC WELDING — Lincoln Electric Co., Cleveland, Ohio. Bulletin 402, the Lincoln Weldirectory, besides tracing the company's growth, gives information and procedure pointers on shielded arc welding, guide for selection of electrodes, and describes units made by the company.

BEARINGS—Link-Belt Co., Indianapolis, Ind. Book 1775 describes and pictures "Friction Fighter" bearings, giving complete tables of sizes, dimensions, and weights. There also are tables of load ratings and minimum life expectancies, with engineering information and aids to selection of the proper unit for each class of service.

BUILDING WIRE—General Cable Corporation, New York City. Calculator gives pertinent information on various types of wiring under the new National Electrical Code, besides expediting computations.

CARBON DIOXIDE SHELLS—Cardox Corporation, Chicago. Bulletin details advantages of Cardox for breaking down coal, including: simplicity, savings, economy, value, safety, etc.

CLAMSHELL BUCKETS — Blaw-Knox Co., Pittsburgh, Pa. Catalog 1757 covers two-line lever-arm units, giving 242 individual bucket specifications. Also presented are dimensions, physical data and cubic feet performance on different classes of material, with a discussion of how to select a bucket.

CONTROLLERS — Manning, Maxwell & Moore, Inc., Bridgeport, Conn. Catalog covers complete line of American self-operated controllers, combined temperature controllers with indicators, pressure controllers, wide-range indicating controllers, wide-range non-indicating controllers, and controlographs, as well as diaphragm motor valves, gives diaphragm motor valve capacity charts, and contains a wealth of other material.

DIESEL TRACTOR—Caterpillar Tractor Co., Peoria, Ill. Catalog Form 6289 gives complete description of working parts of the new 80-hp. D7 unit, with cutaway pictures showing cross-sections of the engine and tractor chassis. Separate sections are devoted to the fuel system, general engine construction features, lubricating system, transmission and final drive, tracks and roller assemblies, and allied equipment.

DREDGING PUMPS—Lawrence Machine & Pump Corporation, Lawrence, Mass. Bulletin 208-2 describes the firm's standard dredging pumps and hydraulic dredge machinery, designed primarily for general dredging service, or pumping sand, gravel, ashes and cinders, and for other applications where the pump is required to handle mixtures of water and abrasive solids.

DIESEL TRUCKS—Chrysler Corporation, Detroit, Mich. Catalog presents full details of Dodge-diesel engine as well as a simplified explanation of the "full diesel" principle, including factual information on the operation of Dodge-diesels in many lines of business under different types of hauling conditions.

ELECTRICAL CALCULATOR—Ohmite Mfg. Co., Chicago. Ohm's law calculator gives the answer to any Ohm's law problem quickly and easily. It has scales on both sides so as to cover the range of currents, resistances, wattages and voltages commonly used in industrial, electronic and radio fields. It covers the current and wattage range for motors, generators, lamps, electrical apparatus and other applications up to 100 amp. or 1,000 watts.

ELECTRICAL EQUIPMENT — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has released the following bulletins: Descriptive Data 211, describing CSP power transformers; Descriptive Data 27-435, on "Rectomatic" battery chargers; Descriptive Data 33-127, on automatic reclosers; Booklet B-2263, telling how porcelain insulators are made; Descriptive Data 31-330, describing automatic mining switchgear; and Descriptive Data 39-350, on transmission line hardware.

ELECTRICAL EQUIPMENT—General Electric Co., Schenectady, N. Y., has issued these bulletins: GEA-2753, "G-E Instruments and Time Switches"; GEA-1542D and GEA-1868B, "Heavy-Duty D.C. Motors"; GEA-2964B, "New Size 1 Magnetic Motor Starter."

ELECTRIC FLOW METERS—Brown Instrument Co., Philadelphia, Pa. Catalog 2007 covers the company's complete line of units for the measurement and control of steam, air, oil, water, chemicals and other fluids, describing outstanding features. Schematic diagrams and layouts also are shown.

FLEXIBLE TUBING—Pennsylvania Flexible Metallic Tubing Co., Philadelphia, Pa. Bulletin 90 describes Penflex Weld high-pressure flexible all-metal tubing. Bulletin

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On receipt of your Stoker Coal specifications, we will be glad to make recommendations and quotation on indicated equipment.

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59-G covers galvanized steel hose and couplings, with descriptive details and engineering data.

GAS CUTTING MACHINES—Air Reduction, New York City, has issued these bulletins: ADC-614A, the No. 10 Radiagraph, portable motor-driven gas cutting machine; ADC-627, No. 4 Radiagraph; ADC-623A, No. 10 Planograph; ADC-628, Oxygraph and Travograph.

HOIST—Vulcan Iron Works Co., Denver, Colo. Bulletin cites features of a new 5-hp. utility hoist, giving specifications and diagrams.

INDUCTION MOTORS—Reliance Electric & Engineering Co., Cleveland, Ohio. Bulletin 119 details salient features of Type AA squirrel-cage units, stressing their advantages.

INDUSTRIAL FIRE HOSE—B. F. Goodrich Co., Akron, Ohio. Catalog Section 3750 stresses improvements in design and construction, describing new fittings such as swivel gaskets made of Koroseal, a synthetic rubber-like material developed by Goodrich.

JACKS—Templeton, Kenly & Co., Chicago, Catalog 40 describes construction, application and gives specifications for the 300 plus sizes and types of Simplex jacks, such as automatic raising and lowering jacks, screw jacks, journal jacks, geared jacks and the more specialized units for various industries, including mining.

PIPE FITTINGS—Taylor Forge & Pipe Works, Chicago. Catalog 401 gives complete data on design, pressure and temperature ratings, and on flange bolting, new test analyses, accepted standards, etc., of its line of seamless steel pipe fittings for welding and forged steel flanges.

PUMPS—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin B-6140, on "Electrifugal" units of 1 to 10 hp. inclusive for heads up to 160 ft., describes the unit construction, incorporating either special splash-proof motors, totally inclosed fan-cooled motors or explosion-proof fan-cooled motors, as may be required.

ROOFING AND SIDING—Republic Stamping & Enameling Co., Canton, Ohio. Folder details advantages of vitric steel corrugated roofing and siding, emphasizing its lasting qualities and low maintenance cost.

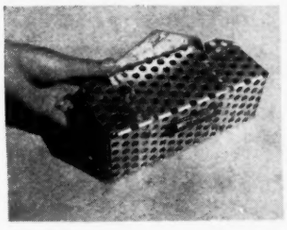
STORAGE BATTERIES—Gould Storage Battery Corporation, Depew, N. Y. Bulletin 200 describes Kathanode batteries for mine-locomotive propulsion. Tables of rated capacity and technical data are included.

TUBULAR PRODUCTS—Babcock & Wilcox Tube Co., Beaver Falls, Pa. Bulletin 11-C contains specifications established for carbon steel and alloy seamless steel tubes by the American Society for Testing Materials and the Association of American Railways, and those established by this company for high-chrome and stainless alloy tubes. The specifications cover the manufacture, finish and workmanship, chemical and physical properties, tests, and permissible variations in weights and dimensions of tubes and pipe.

# WHAT'S NEW IN COAL-MINING EQUIPMENT

### CHOKE RESISTANCE

Choke resistances designed specifically for limiting inrush of starting current to d.c. motors such as used on conveyors and pumps are being offered by the Guyan Machinery Co., Logan, W. Va. For motors rated 230 to 250 volts and operating at around 230 volts, these are now available in 5-, 7½-, 10-, 15-, 20- and 25-hp. sizes. Compactness, terminals and live parts completely inclosed and a hanger bracket at the top for hanging on a nail or spike driven into a mine post are features of the design. A 5-hp. unit is shown in the accompanying illustration.



The choke resistance is connected permanently in the armature circuit and behind the shunt field connection, so there is no weakening of that field. Use of just the right amount of resistance for the duty, it is stated, allows the motors to start upon manual closing of a switch or return of power without flashing on the commutator, yet causes very small loss during normal operation.

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### ARC WELDER

A new a.c. Arcmaster welder, recently announced by the Bear Mfg. Co., Rock Island, Ill., features a multiple coil transformer design said to assure an even flow of current to the electrode and an improved safety construction that provides complete protection for the operator. The manufacturer states that the multiple (four) coil transformer construction with reactance control not only levels the peaks and valleys of power variation to provide a smooth flow of current to the electrode but makes possible a uniform and constant welding voltage with calibrated amperage from lowest to highest output.

Thus, an operator can instantly and easily strike and hold a steady arc with any size rod.

Built for heavy-duty operating conditions, this all-metal unit has transformer laminations of silicon steel and oversize core and wire to withstand heat created under constant usage, prevent insulation breakdown, and avoid complete burnouts. The entire welder case is made of heavy cast aluminum for rapid heat dissipation. The unit is furnished in three models with ranges of 10-200, 10-250 and 10-300 amp. All models have 220, 60-cycle voltages. Each unit includes 20-ft. ground cable, 20-ft. electrode cable, head shield, rod holder and assortment of rods.

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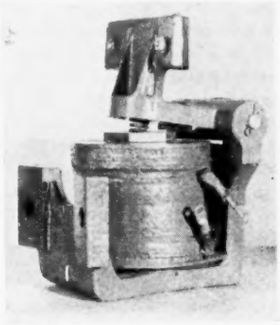
### MINING LOCOMOTIVE, MAGNETIC BRAKE

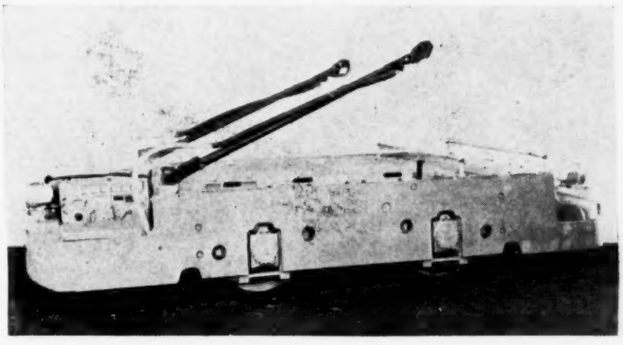
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., offers a new explosion-tested mining locomotive for use in both high and low coal. To operate in low coal it is necessary only to remove the handrails. The cam-type controller is arranged for low-height operation and the drums operate on a horizontal plane. The main drum is equipped with dynamic braking. The forward and reverse movements generally are obtained by means of main and reverse handles, although reversing operations from a single handle can be supplied. A trip-riders' compartment extends across the full width of the locomotive.

These locomotives are equipped with 33-hp. explosion-tested motors, cam controllers, gearless cable reel, anti-friction journal bearings, steel-tired wheels, flush-type-plate side frames, control breather and complete electrical and mechanical details. Dimensions are: track gage, 48 in.; wheelbase, 56 in.; length, excluding bumpers, 13 ft. 2½ in.; height, excluding trolley, 31 in.; and over-all width, 69½ in.

Westinghouse also offers a magnetic brake for use on open-type vertical axis gearless cable reels to prevent unwinding of the

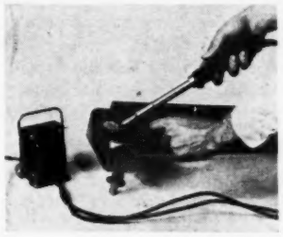


cable due to power failure. The brake is rigidly mounted on the reel motor frame in such a position that the brake shoe contour is adjacent to the inside of the reel drum. As long as power is applied to the reel, a magnetic holding coil in the brake holds the shoe away from the reel drum. This immediate stopping prevents unwinding and snarling of cable.



### QUICK-HEATING SOLDERING IRON

Soldering heat in less than a minute is claimed for a new soldering iron just announced by Ideal Commutator Dresser Co., Sycamore, Ill. Through the use of a special carbon electrode heating element, the tip is quickly



brought up to soldering temperature. The carbon electrode makes contact at point of tip so that heat is concentrated where it is most effective.

Heating is controlled by a thumb-operated button on the handle and continues as long as the button is held down. Heating stops when the button is released, so that current is used only when the control button is held. No damage can be caused by accidentally leaving the unit plugged in. This new iron is recommended for all ordinary soldering purposes, as it is small and light in weight for easy manipulation.

•

### DISTRIBUTION TRANSFORMER

A new distribution transformer with new features said to give improved performance, insuring money-saving operation, has been brought out by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Among its features the company emphasizes these: (1) Revolutionary cadmium-plated three-way terminal cuts installation time, simplifies wiring job, minimizes electrolytic action on copper or aluminum conductors; (2) new, durable steel tank, tested under pressure, prevents oil leakage, assures long life; (3) new sprabonderizing plus triple-coat automobile finish gives positive four-way rust protection; (4) double-conductor insulation provides double safety against winding failures; (5) time-proved core

the "feel" of the load at all times.

Further features are: fully inclosed travel brakes controlled from cab; fully inclosed traction gears running in oil; a 72-in.-diameter machine-finished roller-path turntable with patented self-aligning rollers; anti-friction bearings throughout; free floating center-pin bearings, and welded steel design for strength and resistance to shock loads and to provide positive alignment of machinery parts. The engine is a heavy-duty industrial type gasoline or diesel, of a size usually found only in larger units. Track shoes are 24 in. standard (30 in. optional); crawlers are smooth, self-cleaning and perfect guiding.

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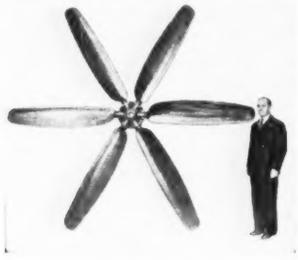
### ADJUSTABLE-PITCH MINE FAN

A specially designed modification of the patented "tear-drop" blade has been developed by the Hartzell Propeller Fan Co., Piqua, Ohio, for mine ventilation. The new blade, it is said, is cast and machined of aluminum alloy and is made especially strong to resist damage from mishandling.



Blade adjustment is extremely easy, a small wrench being the only tool required.

Use is made of the patented Charavay air-seal ring, with which the propeller tips overlap an encircling ring. This mounting is said to eliminate back flow of air at propeller tips, thereby increasing effective air delivery. The fan is made regularly in sizes ranging from 36 to 130 in. in diameter.

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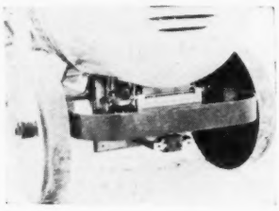
### AUTOMATIC START-STOP DEVICE FOR ARC WELDERS

In an effort to eliminate waste incurred from frequent idling of an arc welder between jobs, Wilson Welder & Metals Co., Inc., New York City, offers a new automatic start and stop device. With this unit the operator starts the welding unit simply by touching the work with his electrode holder.

As long as he is welding, the unit keeps running; when welding is interrupted, the machine automatically stops after a time delay which may be set between



½ and 1½ minutes, to suit conditions of the particular job at hand. The time delay prevents undesirable frequent stoppings in case of a tacking job. The standard device is reconnectable for 220 or 440 voltages (60 cycles only). It is easily installed either on or near the machine.

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### WELDING REGULATORS

Linde Air Products Co., New York City, has added three new single-stage general-service regulators to its Oxweld line of welding and cutting apparatus. These additions, the Oxweld R-80 oxygen regulator for the delivery of oxygen at working pressures up to 200 lb. per square inch, the Oxweld R-8, its companion acetylene regulator, and the Oxweld R-82 fuel-gas regulator, are said to feature simplicity of design and reliability of operation.

The R-80 and R-81 regulators are of the stem type—that is, the valve closes with the incoming pressure, thus assuring positive seating action. The materials used for the valve seats are selected for efficient service and long life. The passageways are of sufficient size to permit unrestricted flow of gases. In addition, the R-80 has a special inlet screen formed of a double thickness of fine mesh to filter out dirt and foreign particles. Since the R-80 and R-81 have only a few working parts, the occasional maintenance which may be required can be performed quickly and inexpensively.

The R-82 also is of the stem type and is for use with various gases such as "Pyrofax" gas, propane and butane. It has the same operating advantages and construction features as the R-81.

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### DRILL BIT

A new speed tool for drilling coal, known as the Kop bit, is announced by Bacharach-Strauss, Pittsburgh, Pa. It consists of a strong drop-forged body to which the two cutting tools (tips) are solidly attached (brazed). A high grade of carbon steel is used for the body and the tip is made of "diamond hard" patented Carboloy material. The bit

is so shaped that the coal chips can move freely from the grooved bit into the flutes of the auger, which convey them quickly out of the hole.

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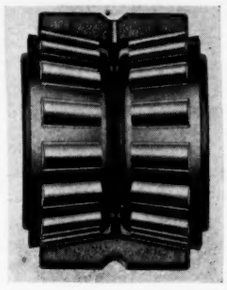
### TAPERED ROLLER BEARING

Timken Roller Bearing Co., Canton, Ohio, has released a modification in the design of the standard NA type, or non-adjustable, roller bearing. Made up of a double-row outer race or cup and two inner races or cones, it is said to be especially adapted to serve as a sheave bearing. The races and rolls are ground to established precision limits so that when the cones are assembled into the cup the front faces of



the cones contact and the proper running clearance is provided. The front cone faces are slotted and chamfered to provide an entrance for lubricant to within the bearings.

The problem of sealing the bearing chamber has been greatly simplified by extending the length of the large cone rib and creating a surface concentric with the shaft and sheave bore on which a seal may be run. These seals have the same outside diameter as the cup and are pressed into the sheave bore and thus are used to hold the bearing together during assembly.

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### WELDING GLOVES

American Optical Co., Southbridge, Mass., offers two new welding gloves. The TX100 glove is made from a good grade of chrome tan horsehide and from a "gun-cut" pattern, with no seams exposed to active wear. All are at the back of the fingers except at the base of the second and third fingers, and these seams are welt-reinforced. The thumb and index finger also are reinforced. This reinforcement is one-piece, continuous from the tip of the index finger to the tip of the thumb. The back of the glove also is one piece, removing any chance of seam breakage under extreme heat. The inside is insulated with wool. The new glove is made in a regular size that measures 14 in. over all, 5 in. across the palm, with a 6-in. gauntlet.

The other new glove—the 3015—of slightly different design, is made on the "gun-cut" pattern from chrome-tanned horsehide, with a seamless palm. All seams are at the back of fingers (where they are not exposed to wear) except for welt-reinforced seams at bases of second and third fingers. Thumb and index fingers are reinforced; back of glove is reinforced with an outside patch.

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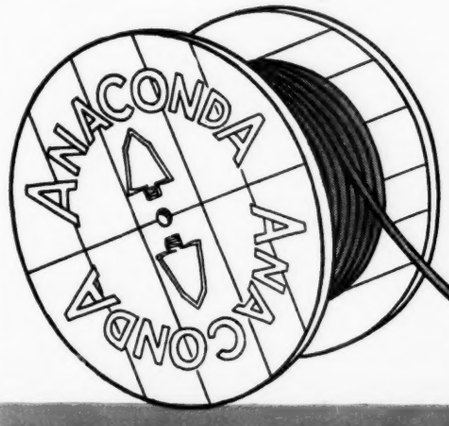


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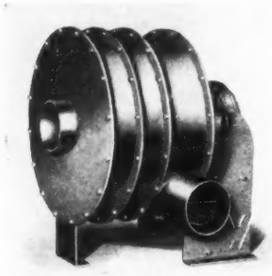
and coil construction designed for years of efficient service-free operation; (6) extra-heavy porcelain coordinated bushings with liberal creepage offer maximum reliability under fog, dust, chemical or other adverse operating conditions.

•

### MOTOR BLOWER

A new motor blower, known as the Type G, is offered by the Ingersoll-Rand Co., Phillipsburg, N. J., which, according to the manufacturer, has, in addition to reliability and quietness, features which make it especially suited to furnishing air for general industrial uses. It can be installed on any floor, as it requires no special foundation.



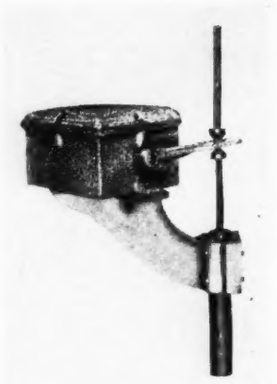
A built-in blast gate is located in the blower discharge and flexible pipe connections are provided for connecting either intake or discharge to shop piping. Maintenance of constant pressure over the entire volume range is stressed as being particularly advantageous in furnishing combustion air to oil- and gas-fired furnaces. Type G units are built in 72 sizes: pressures from ½ to 2¼ lb. and volumes from 100 to 4,500 c.f.m. are available.

•

### ALTERNATOR FOR DUPLEX PUMPING EQUIPMENT

Barclay Control Co., Chicago, offers an automatic alternator for duplex pumping equipment. Known as the Barclay automatic transfer switch, this device is said to provide a simple, positive means of alternating the sequence of pump-motor operation wherever duplex equipment is installed. This unit will automatically cut in the idle pump under flood conditions, or in the event one pump is out of order the other is cut in for each pumping operation.

The outfit consists of a fully housed controller unit with slotted operating lever. This lever is constructed to take all sizes of float rods and cables, so the device is as readily applied to existing as to new equipment. It operates equally well on a.c. or d.c. Installation and wiring



are said to be as simple as installing a pushbutton station; it is said to eliminate need for additional float switches, and an extra rod and float. The entire unit is mounted in a weatherproof cast aluminum housing, and all internal parts are rustproof, being made of aluminum, brass and bronze, cadmium-plated.

•

### FACE SHIELD WITH SLIDING WINDOW

A new face shield with a plastacele window that slides in and out of a fiber frame, making replacement practicable at a fraction of cost, is announced by Boyer & Campbell Co., Detroit, Mich. Besides simplifying re-

placement the fiber frame affords considerably more face protection than the conventional metal-bound type. This frame is interchangeable on all models of B. & C. face shields except 10 and 20.

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### MERCURY SWITCHES

To meet an insistent demand for larger electrical capacities in switches with smaller over-all mechanical dimensions, Durakool, Inc., Elkhart, Ind., announces two radically new mercury switches: No. A-5M and No. A-10Z. According to the manufacturer, both switches have new and novel internal construction characteristics that enable them to carry substantially greater currents than regular Durakool switches with the same dimensions.

The A-5M has a very small required angular tilt for operation and maintains this angle to a remarkable degree even under heavy overload. It is especially adapted to snap-acting mechanisms, as well as tilt action, where it will give a uniform performance. The A-5M can be used in many applications which formerly required the A-10 (10-amp. switch). Similarly, the A-10Z can be used in many applications where formerly the capacity of

the A-10 itself was not enough and the much larger physical dimensioned A-20 (20-amp. switch) was required.

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### PORTABLE PRESSURE OIL FLUSHER

A portable pressure oil flusher and dispenser—known as the Port-O-Flush—for use in flushing out and oiling machinery and other processing or industrial equipment has been perfected by J. A. Honegger, Bloomfield, N. J. Regular re-oiling and flushing to remove particles of dirt, grit or metal can be effected instantly and thoroughly with this unit, according to the maker, as the oil is introduced into bearings at 60 to 100 p.s.i. pressure by means of air or gas pressure.

The flusher will handle oils of all viscosities, it is said, from that of kerosene, for flushing out bearings and transmissions of all kinds prior to oiling, up to

600 W transmission oil for gear and reduction drives. It holds 1 qt. of oil and is so light that a small child can carry it in one hand.

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### VENTILATING DUCT AND TUBING

Two new products applicable for ventilation purposes are offered by Hersey & Co., Seattle, Wash. For exhausting air, light dusts and gas is a tubing known as "Flexaust," a wire-reinforced rubberized fabric with inner and outer rubber coatings holding the wire in place. An airtight coupling closed by a single wing-bolt is available where quick detachment is desired; otherwise, the duct may be slipped over the end of metal pipe or fan inlet. This tubing is available from 4 to 24 in. in diameter.

A new light-weight flexible tubing for blowing, made of rubberized fabric known as "Bloflex," is offered for mine ventilation. It is said to be easily handled and suspended and can be quickly coupled. A positive demountable wing-bolt coupling

closes over the two rings, squeezing them together. Movable grips on the seam are said to make suspension wire unnecessary, as the tubing can be stretched and supported wherever there is a stoll plug or convenient point on the pipe line. Short sections of this type tubing are said to make a "non-wrinkling" elbow of any angle for flexible canvas tubing of all types, being coupled by baling wire.

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### CONVERTIBLE SHOVEL

A new powerful 1- to 1¼-yd. convertible shovel-dragline-crane, Model LS-100, is offered by Link-Belt Speeder Corporation, Chicago. The machine, according to the manufacturer, is controlled by easy-throw levers and equipped with a new type of clutch—a booster system that actually gives